Vol. I AUGUST, 1919 No. 5

# THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry.

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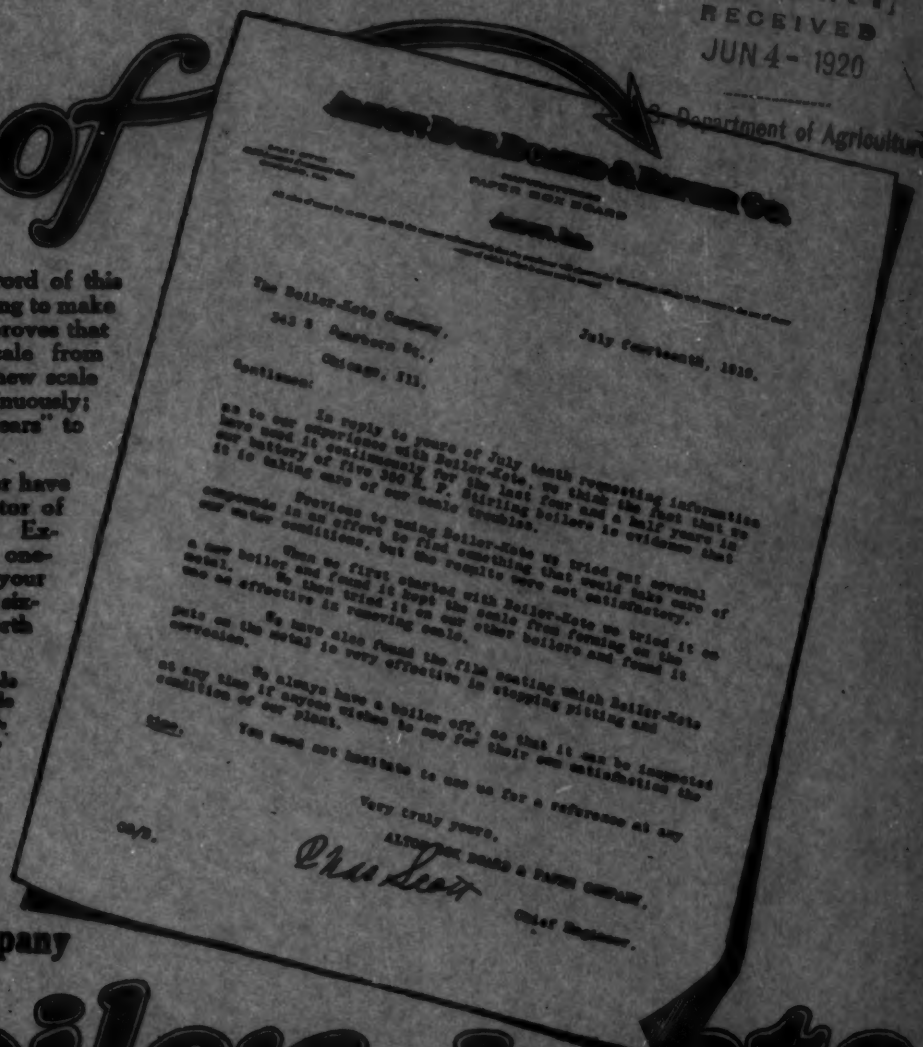

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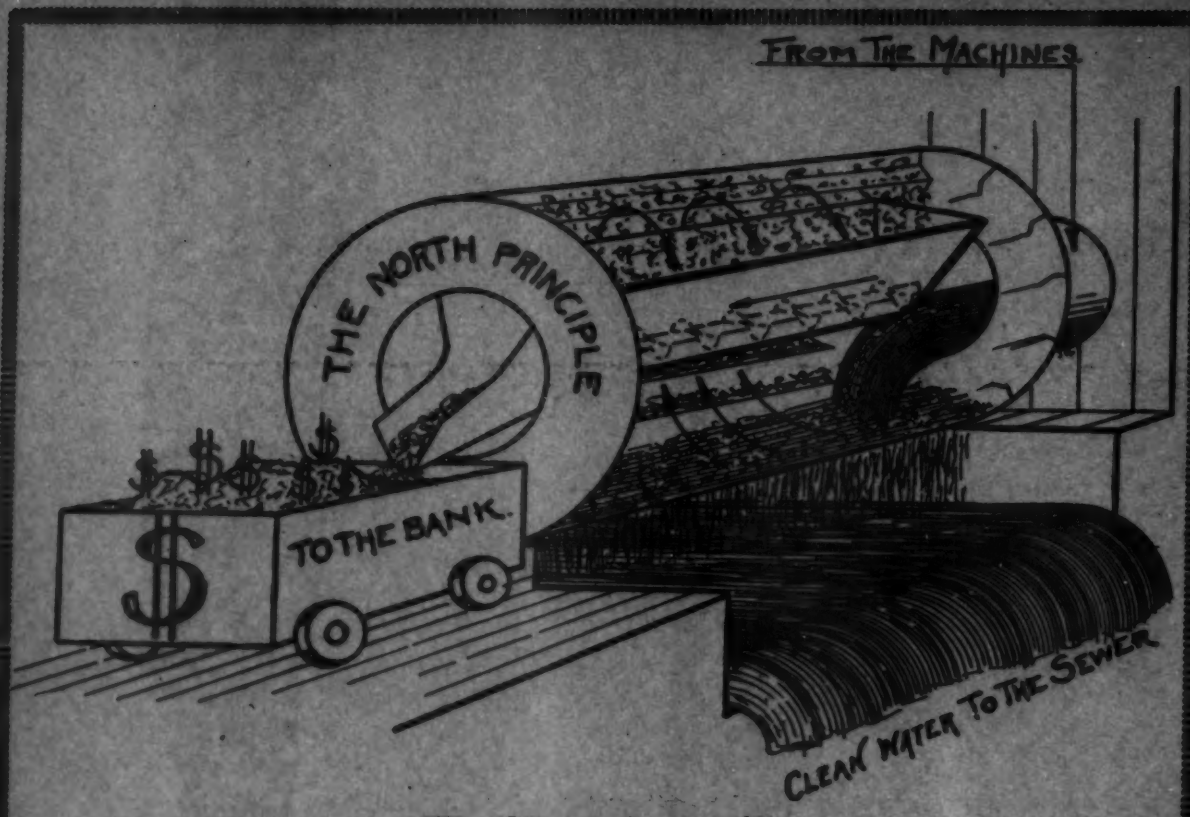


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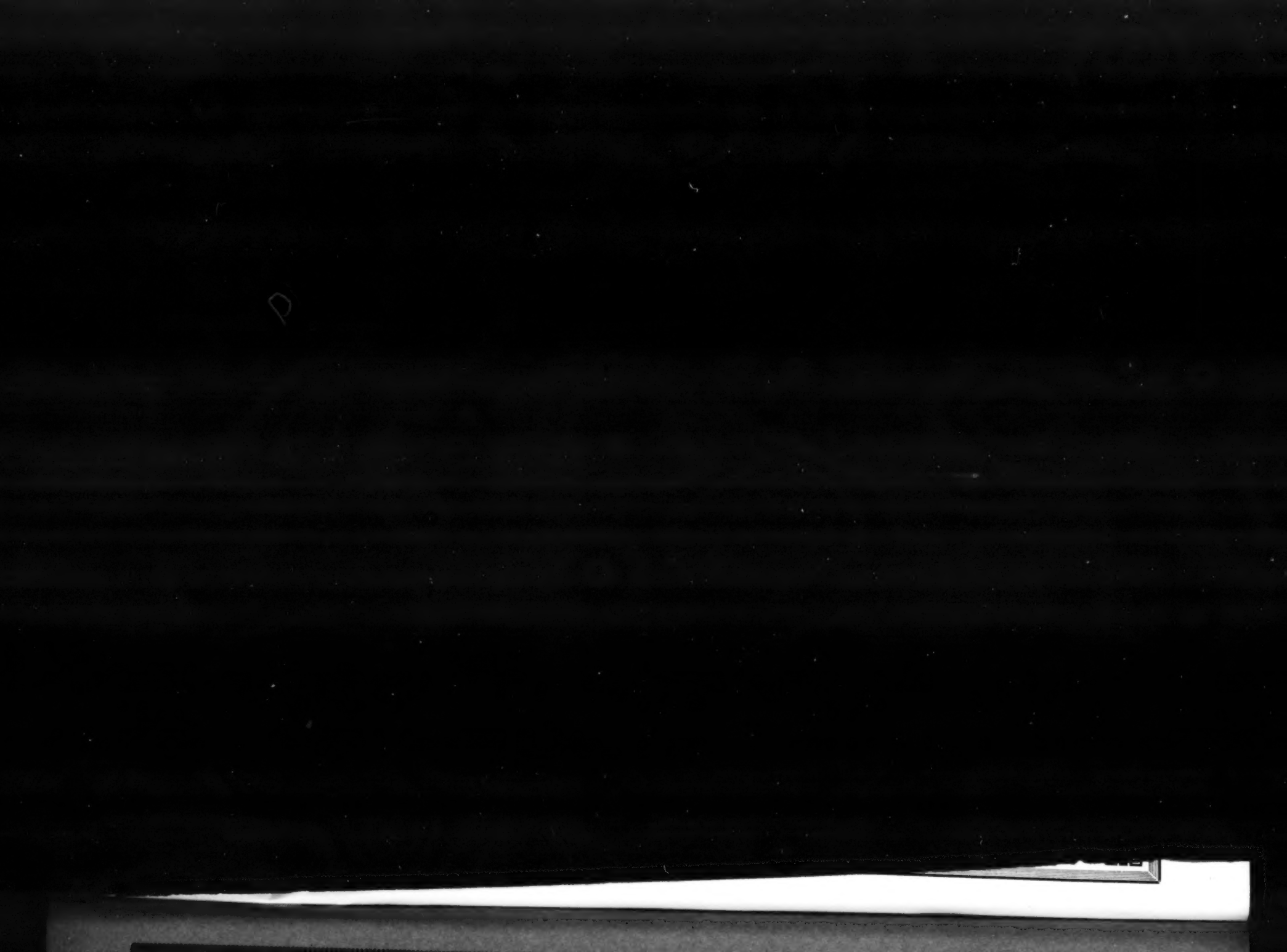

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*QUALITY GUARANTEED STRICTLY HIGH-GRADE*

Vol. 1—No. 5

THE PAPER INDUSTRY

PETER J. MASSEY
Editor

A MONTHLY EDUCATIONAL JOURNAL
*Devoted to the Interests of The Paper Industry*

# CONTENTS

## FOR AUGUST, 1919

| | | Page |
|---|---|---|
| Contents Page | | 324 |
| With the Publisher | | 331 |
| Editorial | | 333 |
| Watch Your Step | | 335 |
| Just a Job | *Edgar A. Guest* | 338 |
| The Shrink and Stretch of Paper | *Peter J. Massey* | 339 |
| The Handling of Bleach and Bleaching Liquor | *F. G. Milham* | 344 |
| Illumination | *H. T. Spaulding* | 347 |
| The Relative Importance of Boiler Scale | *M. B. Millner* | 352 |
| Dyeing of Pulp and Paper | *Otto Kress* | 353 |
| What Kind of Lime Do You Use? | | 357 |
| Straining a Gnat | *William A. Norman* | 358 |
| American Pulpwoods | *Kress, Wells and Edwardes* | 362 |
| Inventory of Soda and Sulphate Liquors | | 369 |
| The Duties of a Third Hand | *Paul A. Smith* | 370 |
| Superintendents' News | | 371 |
| Chips of Information | | 374 to 386 |
| Placing Your Motor on the Ceiling, Power Items, Respirators, $CO_2$ and $SO_2$ Recorders, Ladder Safety, Etc. | | |
| The Markets | | 387 to 397 |
| Buyers Guide | | 399 |
| Alphabetical Index to Advertisers | | 401 |

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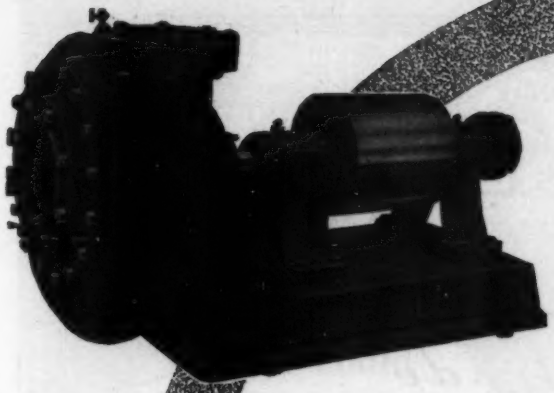

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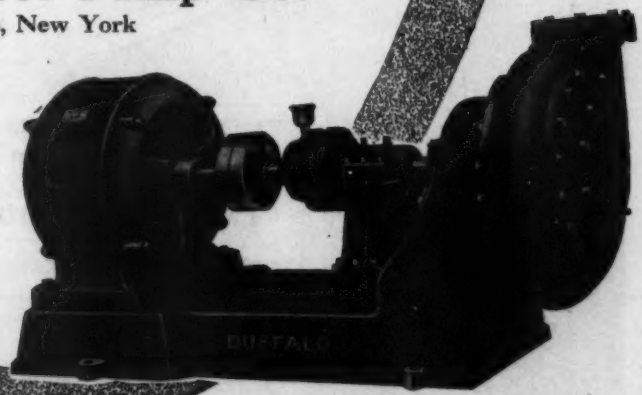

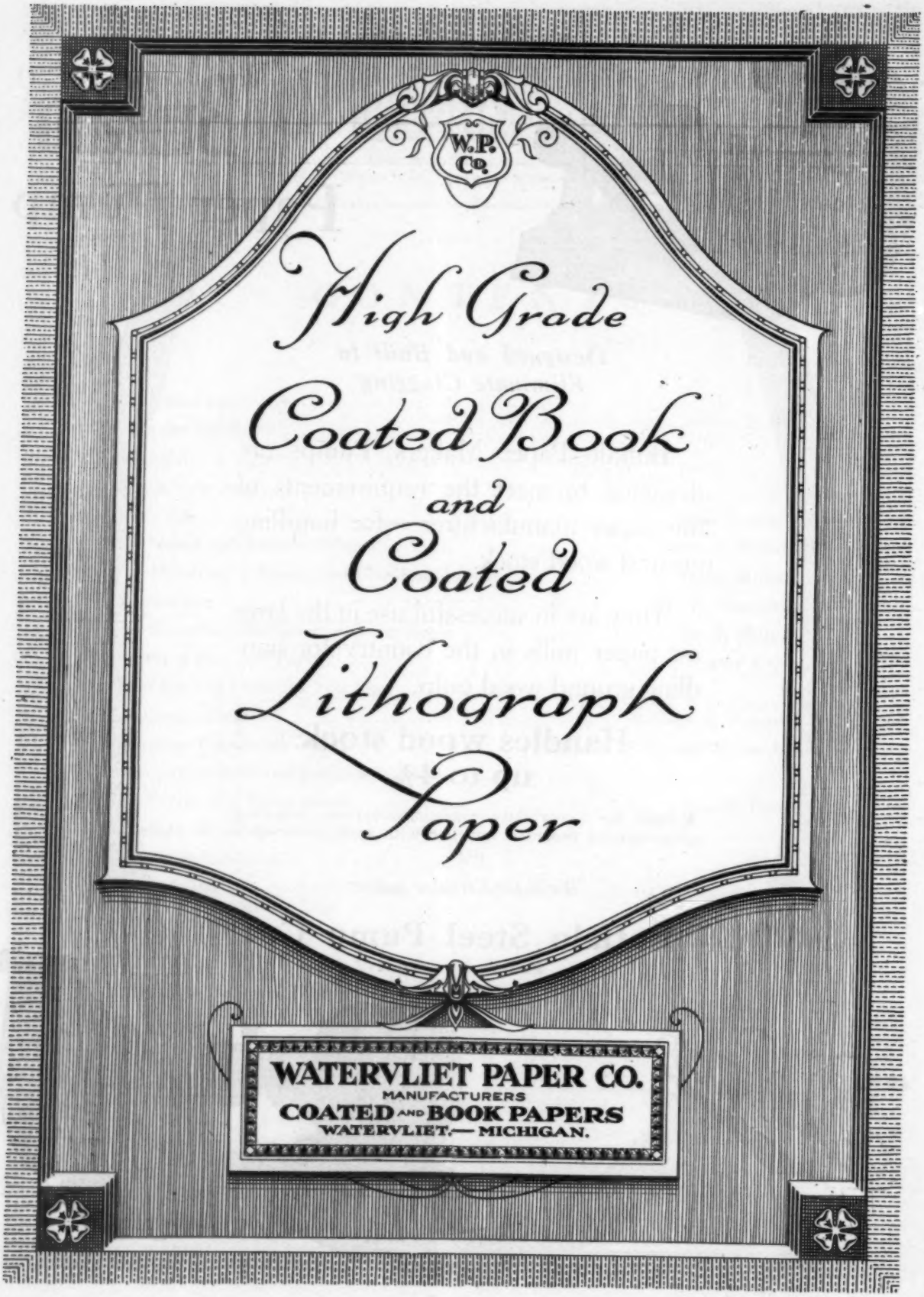
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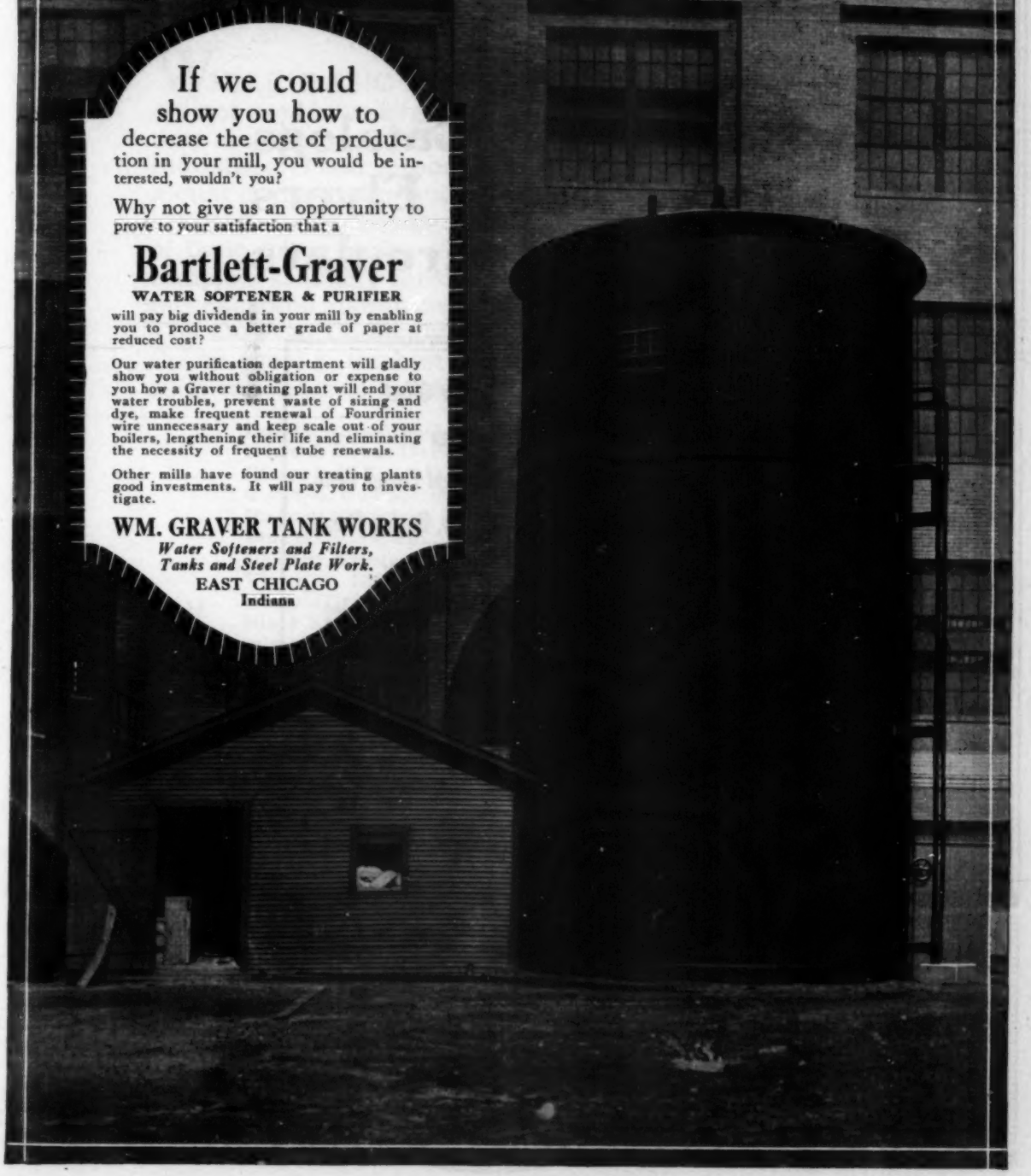

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**WATER SOFTENER & PURIFIER**

will pay big dividends in your mill by enabling you to produce a better grade of paper at reduced cost?

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¶ Magnify it as much as you like.

¶ Make any test you wish.

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**Appleton, Wis.**

# *Circulations and Circulations*

WE believe it was Mark Twain that once said "The main difference between a cat and a lie is that the cat has only nine lives." There are possibly as many untruths told about circulation of all classes of papers as there are about horses at a horse sale. There seems to be no reason why a man should not tell the truth about circulation as well as about any other subject.

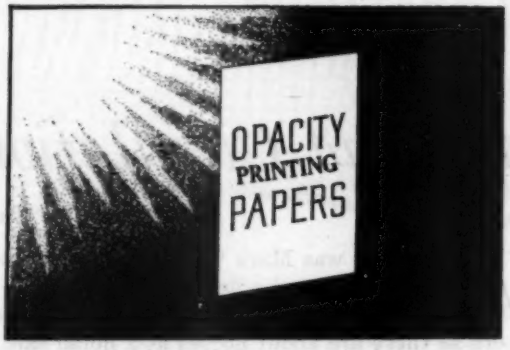
It used to be fashionable to stretch the truth as much as possible in the matter of circulation, but happily times are changed somewhat, and this is not so common as it used to be. We once knew a publisher who had a stereotyped statement that he always made when anyone wrote him and asked him the circulation of his paper. It was this (for though we have not heard it for years, we heard it so often that we could even now repeat backwards with our eyes shut), "Our circulation is greater in the East than in the West, for the reason there are more ———— in the East than in the West." Of course this was enlightening to the man who had made the inquiry, and of course the paper went the same way the Germans did on their way to Paris, that is, backwards.

We also knew another man who sent his men out with a sworn statement, which said that this paper had a circulation of a certain number, and yet the actual truth was that he did not have near 60 per cent of what the circulation statement said. And yet another one, who made the most ridiculous statements, but never would present any evidence to show that the statement was true.

But, as stated, this sort of thing is passing away, and well that it should. Every time an issue of The Paper Industry has gone forth we have made a statement of circulation, for we felt everyone had a perfect right to know what they were buying when they spent their money for space with us.

Someone may ask how do we prove our own statements. To this we wish to say to anyone interested, we shall be very glad indeed to show them our bills for paper each month, also our bill from the printer, which shows on the face of it each month the number printed, and then we shall be only too glad to give the name of our printers and have anyone go to them, and they have our request to tell nothing but the whole truth. Our records are open for the inspection of anyone interested.

Every issue of The Paper Industry has been 3,000 or more. This issue is one of 3,500 copies, and they are all needed.

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Kalamazoo, U. S. A.

*World's Largest Manufacturers of*

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# EDITORIAL

THE prosperity of a State or Federation of States rests upon the efficiency and prosperity of the individual taxpayer. To increase the efficiency of the individuals composing the community is to increase the State's resources, because the State in the last analysis is a collection of individuals.

Herein lies the importance of Education. By Education I mean the cultivation of the mind and the hand of the indivdual, in order to permit him to enter his chosen field of endeavor, and enable him to function efficiently.

The State claims final authority to establish the Standard of Education for the individual members composing it, and considers the taxpayer duty bound to support this stand and without taking into consideration his specific needs.

Insofar as the Elementary Schools are concerned, there is no doubt that they are fulfilling their obligations, which consist of inculcating the rudiments of learning, but, if our other schools are to be worthy of the name, if they are to fulfill their higher functions, they must be more than dry places of study: they must educate the embryo workers in the fundamentals of the industries that are the chief support of that particular State or community.

It is vocational education that will establish the individual in his proper place in the activities of his community, and will bring the various industries that comprise the commercial activities of that community to a higher state of efficiency.

The State needs knowledge, efficiency and idealism in industry, to insure its success and development, and the only means to achieve this result is the right kind of vocational or industrial education.

It is then of great importance to consider whether our present system of education is the one best calculated to fulfill these objects. Does it really inculcate that idealism for the industry which is even more important than learning itself?

This is the age of the specialist, it therefore behooves education to follow the trend of the times and concentrate its energies upon the particular industries that are the most important to the commercial supremacy of that particular community.

True vocational education should aim at efficiency in the special lines of industry that are of vital importance to that particular state or commonwealth.

The Paper Industry is of vital importance to the following States: Massachusetts, Maine, New York, Michigan and Wisconsin. Yet in none of these States is there a papermaking school available to the young men with a common school education, and who, through the force of circumstances, are compelled to enter this field of industry without any further preparation.

We, therefore, call upon all the men who are directly interested in the Paper Industry and the multitude of friends who are indirectly concerned, to assist in a movement for establishing papermaking schools in the States above named.

Let us all get together and press this matter forcibly enough to our legislatures—it already is the goal toward which our leading educators are striving—and we will surely bring about the only real feasible solution for all our industrial problems, the cumulative effects of our combined efforts will then achieve Local Vocational Education for The Paper Industry.

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**MUNISING MICHIGAN**

**MANUFACTURERS OF**

MUNISING M BOND

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**HAVE MADE FOR IT**
**AN ENVIABLE REPUTATION**

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**A**re always Uniform,
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**A**nd can be supplied to you in
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**K**raft and Easy Bleaching Sulphate of unknown Quality.

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***Sole Agents for the United States***

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# Watch Your Step!

PAPER buyers would do well to confine their purchases to current needs, for there is not one single economic basis to warrant the "boosting" of prices at present, and most paper prices are "boosted."

The only reasons prices are advancing are because of a temporary congestion caused by jobbers, consumers and converters all moving at once to the mills. For seven months they dug holes in their supplies until they could not supply the regular consumption of paper from their subnormal stocks. Then they began to order, and general business began to revive, and presto! they all turned in a flock of specifications in an endeavor to fill up in sixty days holes that it had taken them seven months to dig.

Then again when disappointment on deliveries began to show up and speculative orders (and there are lots of them) where sent in, mill prices began to rise, and bingo! everybody began to do it.

Now look out, Mr. Buyer. Prices are up in most lines of paper from 100% to 250%. These advances were caused by the war, and most of them were prices that admittedly were overcharged with "Excess Profit."

Excess Profit was tolerated and even encouraged by the Administration during the war, but remember that "excess profit" in peace times becomes profiteering, a reprehensible and punishable offense under the criminal code. In all lines of commodities profits are high and high profits help to make high wages, and all together produce high costs.

The time has now arrived when excess profits and high prices, and boosting wages must stop. The point of saturation has been reached. Neither laboring men, nor manufacturers, nor middle men can continue to pass on to the poor damned public any further price advances. The war is over. We have had our time of hesitancy, a foolish stoppage of buying after the armistice, and now an equally foolish and stupid attempt to put prices higher than they were during the war because of a perfectly healthy return of demand for depleted supplies. From now on the real adjustment takes precedence, and that readjustment must be a downward tendency of all commodities.

The public is properly in rebellion over living costs. They refuse now to pay inflated prices on top of inflated prices. They are right. The bubble will burst if we attempt to blow it up further. Then will follow a reaction and a collapse of prices such as that predicted would follow the Armistice. We need to remember that high prices both stimulate production and curtail consumption. For instance, silk hosiery dealers all report that high prices have caused the demand to fall off so that the production now is overtaking the demand and silk hose will fall in price.

Between June 1, 1918, and June 1, 1919, food in storage increased 20%. The stocks of eight staple foods showed large increase, yet all of them went up in price. The law of supply and demand had been suspended, but, believe us, it will get active soon, for supply in peace times cannot increase 20% greater than demand without a sinking price.

Federal, State and Municipal authorities are all out to help increase the supplies, open up the storage houses, warehouses and the hoarded army stores in a concentrated effort to reduce prices of foods. They all tell the public that prices are unwarrantedly high and that they will come down, and shortly the public will begin to curtail buying and speculating and prices will sink because for three months now production has been getting under full head of steam. With a curtailed demand and a speeded up supply, something is going to happen, and it is not going to be a further advance of prices.

Wrapping paper production in June was only 60,000 tons for 169 mills reporting to the U. S. Trade Commission. July will show higher production figures, and August will see the production up to the figures of a year ago when these mills produced 80,000 tons. Then, too, stocks on hand at the mills are still large, probably well over 100% greater than a year ago. This will also move into the hands of jobbers and consumers at high war-time prices, prices carrying excess profits largely.

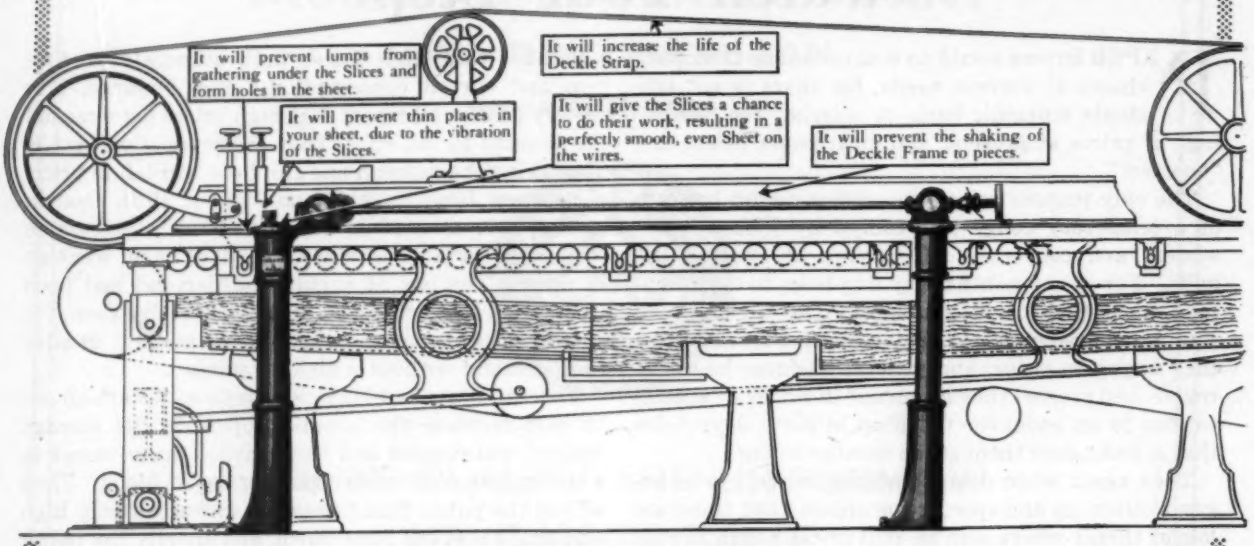
But some one might ask, "What about the export business?"

England on basis of present exchange rates must pays a 15% premium for goods bought here. France pays almost 40%, and Germany somewhere near 70%. They may have to pay these premiums for some of their foodstuffs, but do you think they will pay this for paper supplies bought in volume sufficient to keep American prices up about war-time figures?

This is the time to remain sane. Think and figure and look ahead. Keep business on an even keel. Cut out absolutely all corporate or individual speculation and extravagance. Buy what you need today or this week or this month, but be extremely careful about loading up on future requirements at the present excess profit prices in all lines of commodities.

# The Acme Deckle Frame Support

*"is indispensable to the making of Good paper"*


It will prevent lumps from gathering under the Slices and form holes in the sheet.
It will increase the life of the Deckle Strap.
It will prevent thin places in your sheet, due to the vibration of the Slices.
It will give the Slices a chance to do their work, resulting in a perfectly smooth, even Sheet on the wires.
It will prevent the shaking of the Deckle Frame to pieces.

*It will make better edge, save brakes and take less power.*

*Manufactured and Distributed by*

**HUBAND & NASH**

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*Most of the best mills in this country are equipped with this device.*

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| Press | Couch | Inking | Size |
| Pressure | Harper Couch | Waxing | Guide |
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We also manufacture Rubber Belting, Machine Hose, Deckle Straps, Screen Diaphragms, Suction Box Gaskets and Connections.

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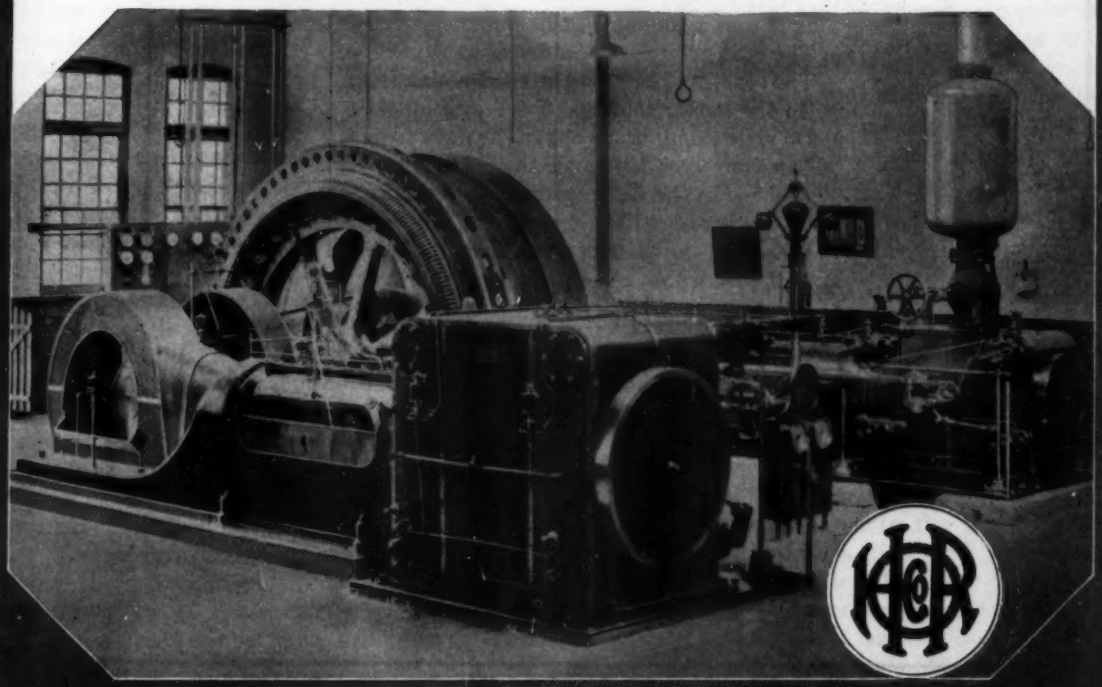

# Just a Job

IS IT just a job that is yours to hold,
A task that offers you so much gold,
Just so much work that is yours to do,
With never a greater goal in view?
What do you see at your desk or loom,
Or the spot you fill in life's busy room?
Merely a flickering light as the mill wheel turns
And the same old grind in the same old ways
With all the tomorrows like yesterdays!

Is it just a job, just a task to do,
So many pieces to build anew?
So many figures to add, and then
Home for a while and back again?
Are you just a clerk in a gaudy shop,
Pleased when a customer fails to stop,
Finding no joy in the things you sell,
Sullenly waiting the quitting bell?
Are your thoughts confined to the narrow space,
And the dreariness of your present place?

Is it just a job, or a golden chance,
The first grim post of a fine advance,
The starting place on the road which leads
To the better jobs and the bigger deeds?
Do your thoughts go out to the days to be?
Can your eyes look over the drudgery
And see in the distance the splendid glow
Of the broader life that you too may know?
What is your view of your circumstance,
Is it just a job, or a golden chance?

*Edgar A. Guest.*

Ans. $3.56 per

THE PAPER INDUSTRY

*"The Educational Magazine for the Paper Industry"*

Volume I AUGUST, 1919 Number 5

# Difficulties Encountered in Printing Papers

By PETER J. MASSEY

## Part III—The Shrink and Stretch of Paper in Color Printing

ONE of the most important difficulties encountered in printing papers, which has, no doubt, been the cause of more complaint than any other, is defective register in color printing, due to the hydroscopic nature of paper, which causes it to expand in the presence of moisture and to contract on drying. This fact, coupled with the variable atmospheric conditions encountered by the paper from the finishing room at the mill until the time it receives the last impression in the press room, makes the registration of several superimposed colors a very difficult matter.

In every paper mill manufacturing paper for color printing, and in every printing establishment doing this class of work, it is a well known fact that when excessive humidity prevails, the paper expands to such an extent that perfect register is out of question. The percentage of waste is then so high that the profits are almost wiped out and the quality of work produced is very inferior.

It is the object of this article to point out the various factors that have a bearing on this subject in such a manner that both the paper maker and color printer will be able to see more clearly the limitations in both the paper making and printing processes that prevent this difficulty from being entirely overcome; also to point out, if possible, some methods of procedure that may be of assistance in minimizing these difficulties. If this should assist in removing a few of the misunderstandings now existing on this subject between the paper maker and the printer, and bring about a little more cooperation for the production of a better printed sheet, it will have accomplished its mission.

The various misunderstandings in this matter are not due to the scarcity of literature on this subject, as almost every writer on the technique of printing has at some time or other broken into the columns of the technical press with an article on the subject of "shrink and stretch" of paper. Whenever some author happened to be at a loss for new ideas, this was the subject matter chosen. In spite of the fact that the literature on this subject is so voluminous, it has not rendered any appreciable assistance in bringing about a clearer understanding of the problems involved; it has more likely had a tendency to increase the misunderstandings, as in a number of these articles no consideration was given to the limitations that govern the other fellow's art. The following phrases, taken from a few articles on this subject, will give some idea of the information they disseminate for the further confusion of the papermaker and printer.

"The papermakers ought to make us some paper that won't stretch, but they are a lazy lot and will not do it. You see it is only a matter of properly pressing and stretching the pulp on the paper machine."

". . . he often sends in a veritable storage battery of static electricity into the pressroom from the paper mill in the form of paper."

"The trouble is occasioned by the fact that the majority of the printers are established in basements where moisture is extremely high."

Such statements surely cannot be expected to be of any material assistance in bringing about a more

perfect understanding between paper maker and printer, nor are they of any assistance to the large buyer of printing in determining the cause of a poorly printed job.

## New Business Methods

The period of secrecy and superstition in business has passed, and has been superseded by an era of enlightenment and co-operation. The real successful business of today is not conducted on the old principle of keeping the customer as ignorant of the processes involved as possible in order that inferior work may be "slipped over" with a lot of hocus-pocus about the ART, but on the principle of enlightenment whereby the customer may know all of its limitations and not ask nor expect impossibilities, with the result that the manufacturer and consumer of the commodity are always on cordial relations. Your business is founded upon the services you render the customer; it is upon that service that your charges are based, and as a customer who is entirely ignorant of your processes cannot realize the value and importance of these services it stands to reason that your satisfied customer is the one who has enough knowledge of your business to appreciate the importance of the services you have given him.

## The Salesman's Responsibilities

Some paper salesmen do not work on this basis. They therefore tend to increase the misunderstandings between the papermaker and the consumer. Every paper salesman must realize that he is not only selling paper, but that he is also selling service, and that this service is the difference between satisfied and dissatisfied customers. All paper salesmen should be able to advise the customer as to what paper will be best suited to the requirements of the job on hand. They should know what conditions the paper is expected to meet, and the purposes for which it is intended, so that they will be in a position to advise intelligently, whenever the paper fails to give entire satisfaction.

Very often a printer will come across a shipment of paper which, in his opinion, is the perfect article, as it may have fulfilled every pressroom and bindery requirement. There are many reasons why this particular lot of paper should have given satisfaction; the atmospheric conditions prevailing in the pressroom while that particular job was being printed may have been ideal, the paper may have been stored for some time under conditions that closely approximated those prevailing in the pressroom; either one of these conditions may have been responsible for the results obtained.

The printer does not know why the paper has performed so well, and cares less; all that he is interested in is how much of that stock he can get and how quick he can get it. The paper salesman is called up and informed of the wonderful results achieved and is asked to take down an order for a large shipment that will be exactly like the last lot. The order is accepted on that condition, without any explanation being asked, or investigation made, as to why this particular lot of paper should have given better satisfaction than any other lot the printer may have previously had from the same company, nor is the printer acquainted with the fact that it is impossible to make two shipments of paper EXACTLY ALIKE; the order is just filled and takes its regular routine.

In course of time the paper is delivered to the printer and goes to press. This lot may have been taken from storage and is part of the same mill shipment as the previous lot that gave such perfect satisfaction, but the atmospheric conditions have changed, and the paper gives considerable trouble, through no fault of the paper, but through poor salesmanship. The acceptance of an order on such conditions results in a dissatisfied customer and the loss of good will to the paper manufacturer.

## Salesmen Must Know Their Product

The salesman who believes his whole duty begins and ends with the filling of an order for his product, and who gives no advice or service, or does not have enough knowledge on the subject to enable him to advise his customers on matters pertaining to the various uses of his product, is a very expensive luxury for the paper man who employs him, and is an injustice to the whole industry.

No salesman should ever make the statement that he will duplicate EXACTLY any previous shipment, as that is not only a physical impossibility, but is neither asked nor expected in any other commercial product.

## Physical Characteristics of Paper

The relative importance of the physical properties of paper vary according to the purpose for which it is to be used. In some instances, such as ledger, bond, wrappings, etc., tensile strength and tearing resistance are the most important qualities sought. With envelope, lightweight catalog and book, the chief requisites are opacity and printing surface, while in papers for color printing and lithography the most important quality is resistance to "shrink and stretch." From these few illustrations it may readily be seen that the most difficult qualification to be filled by the paper manufacturer is the one demanded by the color printer and lithographer, as it is diametrically opposed to the physical properties inherent to the papermaking fibers from which the sheet is made.

In a discussion of this character it will be necessary to give, in a general way, a description of the manufacturing processes used in papermaking in so far as they may relate to the subject under discussion, also to give a delineation of the various raw materials used, explaining in detail some of their

physical properties. This will enable the reader to more readily understand the necessity of taking certain precautionary steps in the making, handling, packing, shipping, storing and printing of the finished product, that may be outlined later, so that the conditions complained of might be cured or minimized.

## The Manufacture of Paper

The manufacture of paper consists essentially in producing a cellular network of fibers. To this network of fibers may be added certain substances, or it may undergo some added operations that will produce the characteristics desired, and make it available for the purpose intended. The foundation and framework of any paper is the cellulose fiber. The filler, size, color, finish, coating, etc., are only the superstructure, and are incorporated into the fiber in order to facilitate certain processes in the arts. No matter what the added ingredients may be, or the subsequent treatment it is subjected to, we must always bear in mind that paper is essentially a network of cellulose fibers.

The chief sources of the cellulose fibers used in paper making are rags and wood. The rags, of course, are subject to all the ills with which the name rags is identified, and are classified into more than sixty recognized grades. The wood is subject to all the ills and eccentricities of growth inherent to the vegetable kingdom. The fibers from these two sources are subjected to various processes, such as cutting, grinding, cooking, bleaching and beating, before they can be made available for the actual paper making operations on the paper machine.

## Rag Papers

The rags are cut into strips and the buckles, buttons and other foreign matter removed. They go to a dusting machine, which removes all the dust, often as much as six per cent of the original weight. From the duster the rags are taken to the rotaries, which are either cylindrical or spherical shaped steel tanks about twenty feet long or nine feet in diameter, respectively, and are mounted on suitable supports, so that they can be slowly rotated. About three tons of rags are dumped into the rotary for each charge, and the manhole is then sealed. The rags are cooked in this boiler with a solution of caustic soda, milk of lime, or a mixture of lime and carbonate of soda, under a pressure of about thirty or forty pounds. The required amount of solution is admitted into the boiler through a hollow trunnion, after which the steam is admitted through the other trunnion to the required pressure.

The conditions under which the rags are boiled, such as the strength of solution, pressure and length of time boiled, vary according to the grade of rags used, and for what grade of paper they are intended. After the rags are boiled for a sufficient time, which is generally from three to six hours, the steam is turned off and the rotary blown to reduce the pressure enough to allow the removal of the manhole cover. The rags are then discharged into a tank in the floor.

The rags are then washed thoroughly in the washing engine to remove all the dirt and cooking liquors. The washed rags are then bleached to the desired white color with chloride of lime or bleaching powder. When the required color is achieved, the bleach residues are removed by washing the rags in a drum washer. They are then discharged into cement, fire brick or porous tile drainers, where all the water is allowed to drain off. The rags from this stage are known as half stuff and are ready for the beating process.

## Wood Papers

The conversion of wood to paper making pulp is divided into two general classes of operations—the mechanical and the chemical. The preliminary preparations of the wood, while they are similar for both processes, differ in regard to the wood used and the length of time the wood is seasoned. The chief wood used for mechanical pulp is spruce, and is not seasoned before use. The wood used for the chemical process is mostly spruce, hemlock, balsam, fir and pine, which has been preferably seasoned from one to two years, in order to conserve the chemicals and obtain more uniform results, as the seasoned wood does not require as drastic a treatment and yields a more uniform pulp.

## Groundwood Pulp

The mechanical process consists of placing blocks of wood from which the bark has been removed into pockets of a heavy iron frame and pressing them against a grindstone in the interior of the casing by hydraulic pressure. Water is flushed on the grindstone continuously to keep down the temperature, for if the temperature is allowed to get too high, the pulp will be ruined.

The pulpy mass of ground wood that is washed off the stone by the flushing water is floated onto a screen that is fine enough to retain all the particles of wood that have not been ground, such as slivers and shives. The washed and screened pulp is then floated to a wet machine, where it is taken off in sheets containing about sixty per cent of water, and is then ready for the storage, shipping or beater room.

## Chemical Wood Pulp

Chemical wood pulp is divided into three classes the sulphite, sulphate and the soda processes. The preliminary treatment of the wood for the chemical processes is of the same general character as the treatment of the wood for mechanical pulp, but there is in addition to this an operation called chipping that slices the barked two-foot bolts of wood into ⅝-inch chips cut across the grain, in order to have as much wood surface available to the action of the

chemicals used as possible. These chips are stored in bins over the digesters or cooking cylinders.

## The Sulphite Process

The largest tonnage of chemical pulp is produced by the sulphite process, which consists in cooking the wood under pressure with a solution of calcium bi-sulphite or a mixture of calcium and magnesium bi-sulphites. The digesters used in this process are very large, the largest having a capacity of about thirty cords of wood, and are not rotated. The bi-sulphite liquor is prepared by burning sulphur in specially built furnaces with the exact amount of air to furnish sufficient oxygen to form sulphur dioxide. After cooling, the gas is then led up through the bottom of a tank containing milk of lime that is kept continuously agitated. The sulphur dioxide gas combines with the water to form sulphurous acid, which reacts with the lime to form the calcium bi-sulphite; or, by the tower system, where the gas is led in at the bottom of the tower containing limestone, wherein water is sprayed on the limestone from the top and absorbs the sulphur dioxide, forming sulphurous acid, which attacks the limestone and forms the bi-sulphite liquor.

The required amount of wood chips are dumped into the digester and the bi-sulphite liquor is pumped in. The digester is then closed and the steam admitted from the bottom and a pressure of ninety pounds and a temperature up to 310 degrees Fahrenheit is maintained for from four to ten hours with quick cooks, and fifteen to twenty-seven hours at forty-five pounds pressure for the production of Mitscherlich pulp by the indirect method of pulping. The contents are discharged by being blown out under pressure against a bronze plate called a target, which disintegrates the chips to a pulpy mass. The pulp is then washed free of sulphite liquor and passed over screens to remove knots and undigested chips. After thickening the pulp is ready for bleaching.

After the bleach residuals have been washed out, the pulp may be made into sheets on the wet machine in order to facilitate handling and shipping, or it may go directly to the beater.

## The Sulphate Process

The sulphate or Kraft process of pulping reduces wood to pulp by subjecting the chipped wood to the action, at elevated temperature and pressure, of a solution of caustic soda and sodium sulphide. This is the pulp used for producing kraft paper, which has gained such great popularity in the last few years. Due to the alkaline nature of the cooking liquor, it has made available for use in paper making many resinous woods, such as the yellow pine, that would be impractical with the sulphite process.

## The Soda Process

This pulp is very seldom bleached, being used for the manufacture of wrappings where color is not important and strength is the dominant factor.

The soda process is used in the reduction of short-fibred woods, such as poplar, gumwoods, beech, etc., by digesting the chipped wood with a solution of caustic soda. In both the soda and sulphate processes the pulp is washed after the digester is blown, for the recovery of the cooking chemicals employed. The chipped wood is digested with approximately 20 per cent of caustic soda by weight of the wood, using direct steam.

Poplar wood is most generally used in this process, the wood chips being prepared as in the sulphite process, and are dumped into a steel digester, and the caustic soda solution of about ten degrees Baume is added. When the digester is filled, the cover is bolted down and the steam is turned into the digester, until a pressure of 90 to 110 pounds is reached. The duration of the cook is from six to eight hours. It is then washed and bleached, as in the sulphite process, except that in the case of soda pulp the cooking liquor is recovered. Soda pulp is a soft, short-fibred stock and is largely used as a filler in the manufacture of magazine, book, litho, envelope and other papers where bulk and soft texture are required.

## Beating

The pulps, or halfstuff, as they are now called, are submitted to the process known as beating, an operation effected in the beating engine or "beater," which is an oval-shaped trough having semi-circular ends and divided into two channels by a partition called a mid-feather, which extends down the center of the trough but does not reach the ends. In one of these channels is operated the beater roll, equipped with numerous knives that can be revolved at any given speed and in more or less close contact to the bedplate, fitted with stationary knives to the bottom of the channel. The distance that the roll is from the bedplate, the length of time of beating and the character of the original pulp, governs the kind of paper to be made.

The halfstuff, which may be a blend of several different kinds of fibers, is placed in the beater with the beater roll off the bed plate. When the halfstuff has been somewhat disintegrated and a homogenous mass secured, the beater roll, which is capable of fine adjustment, is lowered down gradually. This treatment reduces the fibers to any desired length and splits the individual fibers to such a degree that they will produce the desired felting properties or sheet formation.

The floor of the channel containing the beater roll slopes upward toward the beater roll and then falls suddenly behind the roll and is known as the back-fall, which assists materially in the circulation of the halfstuff. This circulation of the pulp in contact with the water and under the action of the beater roll is a long and costly process requiring large power consumption for the suitable preparation of certain papers.

After beating, the pulp is pumped to the stuff chest, with enough water to produce a working consistency, where it is kept agitated to maintain a uniform density. From the stuff chest the diluted pulp is pumped into the stock regulating box, which regulates the supply of pulp to the paper machines. The pulp then flows from the regulating box directly to the sand traps, where it is further diluted with water to the consistency that will allow it to run properly on the machine. It then flows through screens where any dirt, lumps or other foreign substance that has not been caught in the sand traps is removed, to a narrow box, the length of which is the full width of the machine, and overflows onto a thin sheet of rubber called the apron. The lower end of the apron rests upon the first roll supporting an endless wire which carries the pulp forward.

## The Paper Machine

The formation of the sheet on the paper machine is a very delicate mechanical operation, notwithstanding the large proportions of the machinery used. The slightest disarrangement of the paper machine mechanism will be reflected in the finished paper. The fibers suspended in water are flowed onto the wire to form the sheet and the bulk of water removed, at a speed of from 100 feet per minute for high grade writings to over 800 feet per minute on news print. The stock must be flowed onto the wire uniformly, as the slightest variation will be reflected in the finished sheet and make it unsaleable.

The wire is about 50 feet in length and is stretched on two rolls, the breast roll and the couch roll. It is supported between the two large rolls by a large number of small rolls called tube rolls. The pulp moves forward on the moving wire and passes under one or more brass straight edges placed across the width of the wire, called slices, which determine to a certain extent the thickness of the sheet. In order to prevent the pulp from spreading too much, two bands of square section rubber, acting as containing walls for the mixture of stock and water, travel on each side and in close contact with the wire, and are called deckle straps. Directly the pulp flows under the slices the water begins to drain through the wire and is further drained by vacuum suction boxes, actuated by powerful pumps. The wet paper is now carried by the wire between the two couch rolls, the top one having a felt covering. The fibers are pressed and made to adhere together, the wet sheet of paper leaving the wire and adhering to the couch roll.

The rapid flow of the stock onto the wire causes the majority of fibers to assume a position parallel to the sides of the wire and point in the direction they are traveling. To overcome this tendency, a sideways shaking motion is given to the whole wet end of the machine. This shake causes some of the fibers to assume positions at right angles to the wire direction and assists in equalizing the strength of the sheet in the two directions.

After passing the couch roll, the sheet leaves the wire and adheres to the couch roll, from where it is carried forward by a felt and made to pass between the first, second and, on some machines, the third, and even a fourth, pair of press rolls, in order to remove as much of the water still present as possible, and to smooth out the marks from the wire, and have both sides of the sheet look alike, before it enters the dryers.

When the sheet leaves the wet felt and starts upon its journey through the dryers on the dryer felts, two-thirds of its weight is water. This water has to be evaporated within a distance of 1,150 feet at most, and at a speed of from 100 to 800 feet per minute, in order to deliver a dry sheet to the machine calenders. The drying must not only be done rapidly, but with great accuracy. The sheet must be uniformly dry and contain the same moisture content throughout its entire width or the product will not be entirely satisfactory.

The dry sheet then passes through one or two stacks of machine calenders, where the desired "finish" is imparted to the paper. Should the sheet vary in the slightest degree in moisture content, it will be spotted, each damp spot or streak being "burnt" or darkened in color by the calender rolls.

The sheet is then wound on a reel to about 30-inch diameter, and rewound into rolls of the various sizes and diameters that the order may call for, or they may be taken to the finishing room to be supercalendered, coated, or both.

## The Permanency and "Purity" of Paper

Paper manufactured from rags is the most permanent and pure, because cotton is the purest form of cellulose known, while paper containing ground wood is the most fugitive and impure, as all the incrusting matter of the wood is retained in the finished paper.

While filter paper is the standard for purity, as it is simply an aqueous deposit of pure cellulose, it would have practically no other commercial use, as it does not fulfill the requirements of the innumerable purposes for which paper is used. To meet with these various conditions of application it is necessary that certain substances be added to the paper. These substances may be added to the papermaking fibers during the beating, or they may be incorporated into the finished paper by additional operations, such as tub sizing and coating. These various substances can not be considered impurities in the sense that they are a commercial adulteration, as they are an essential ingredient to produce the desired qualities in the finished paper that will conform with the specific requirements of the various industrial arts.

*(Continued in the September number)*

# The Handling of Bleaching Powder and Liquor

By E. G. MILHAM
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IN many paper mills, the matter of economically handling chemicals in general and bleach in particular, has apparently been very seriously overlooked or neglected. The writer has visited a large number of mills in which the apparatus for handling and storing bleach and other chemicals was extremely crude, and located in most inconvenient and unsuitable places. Of course, as a natural result, serious losses of chemicals have occurred, most of which could have been avoided if as careful attention had been given to the matter of handling the chemicals as was given to the location and equipment of the machine room or the finishing department. In the following paragraphs a few notes will be given regarding the economical handling of one of the important chemicals; namely, bleach.

## Chemical Characteristics of Bleach

At present, by far the most generally used bleaching agent, so far as paper making is concerned, is bleaching powder, or "Chlorinated lime." This material is made by the action of chlorine gas upon slaked lime, according to the following equation:

$Ca(OH)_2$ plus $Cl_2$ Gives Ca-Cl-O-Cl plus $H_2O$
(Slaked Lime plus (Chlorine) Gives (Bleaching Powder) plus (Water)

The bleach usually comes to the mill as the powder (Ca-Cl-O-Cl) sealed in air-tight iron drums. In this condition it is fairly stable, but not entirely so. This is shown by a series of tests where samples of commercial bleaching powder in sealed glass tubes, were allowed to stand for six weeks out of contact with light under different temperature conditions; tests being made for the percentage of active ingredient (available chlorine) in the powder, both before and after exposure. The results of the tests were as follows:

Fig. #1.

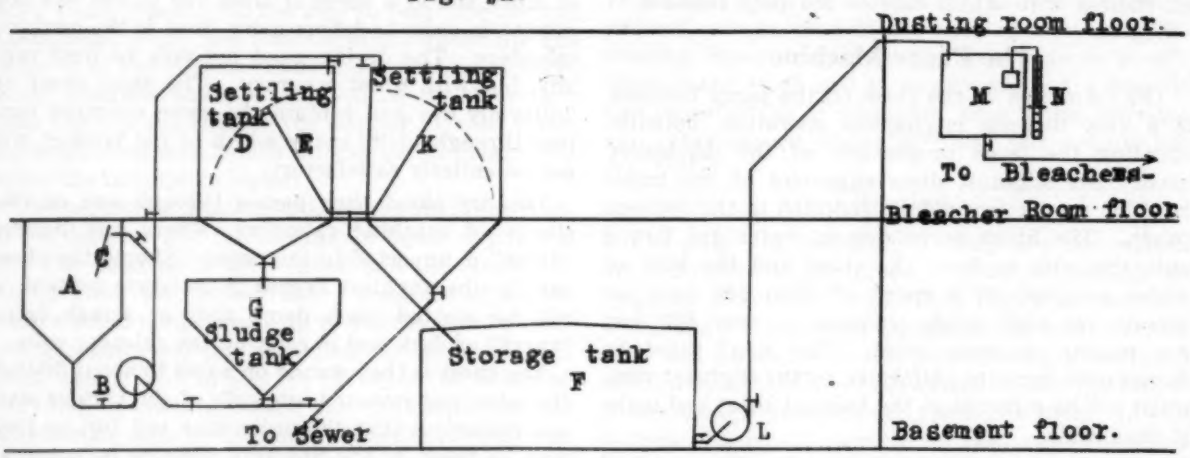



TABLE NO. 1

| Sample No. | Time Exposed | Aver. Temp. (F°) | % Avail. Cl. Before | % Avail. Cl. After | % Loss (Avail. Cl.) |
|---|---|---|---|---|---|
| 1 | Six Weeks | 64°F | 35.5% | 35.1% | 1.1% |
| 2 | Six Weeks | 70°F | 33.9% | 35.0% | 2.5% |
| 3 | Six Weeks | 86°F | 36.8% | 34.0% | 7.6% |
| 4 | Six Weeks | 101°F | 34.2% | 29.1% | 14.9% |

## Loss of Chlorine in Air Tight Drums

From the above figures, it is very evident that bleaching powder, even in air-tight drums, should be stored in as cool a place as possible. The same thing applies to the liquor obtained when the powder is mixed up with water and made ready for use in the mill. The following (Table No. 2) gives the results of test made on bleach liquor stored in a covered, but not air tight, ten-gallon jar and exposed to varying temperature conditions. Hydrometer readings and tests for available chlorine per gallon of liquor were made every three days. The slight loss in volume of liquor, due to evaporation, was corrected before each test by adding the proper amount of water. The liquor was kept in the dark for all tests excepting number five, which was exposed to diffused daylight. The results of the tests were as follows:

TABLE NO. 2

| Test # | Time Exposed | Aver. Temp. | Hydrometer Test Before | Hydrometer Test After | Cl. per Gal. Before | Cl. per Gal. After | Av. Loss per Wk. |
|---|---|---|---|---|---|---|---|
| 1 | Six weeks | 64°F | 6.0°Be' | 5.8°Be' | .196 lbs. | .181# | 1.3% |
| 2 | Six weeks | 70 " | 6.2 " | 4.9 " | .204 " | .153" | 4.2% |
| 3 | Four weeks | 88 " | 5.5 " | 5.0 " | .171 " | .100" | 10.3% |
| 4 | Three weeks | 99 " | 5.0 " | 4.2 " | .151 " | .028" | 27.2% |
| 5 | Two weeks | 70 " | 6.2 " | 6.1 " | .204 " | .017" | 46.0% |

The above table is interesting, for it suggests several things, such as (1) the importance of storing the liquor in as cool a place as possible, (2) the advantage derived from keeping the volume of liquor stored down to the minimum, and (3) the absolute lack of any constant relation between the specific gravity (Baume reading) of the liquor and the content of available chlorine per unit volume. However, in spite of this last mentioned fact, some degree of faith can be placed in the hydrometer reading if the quality of bleaching powder and the treatment used in making up the liquor is uniform, and if the relation between specific gravity and available chlorine is checked up fairly often by an analysis of the liquor.

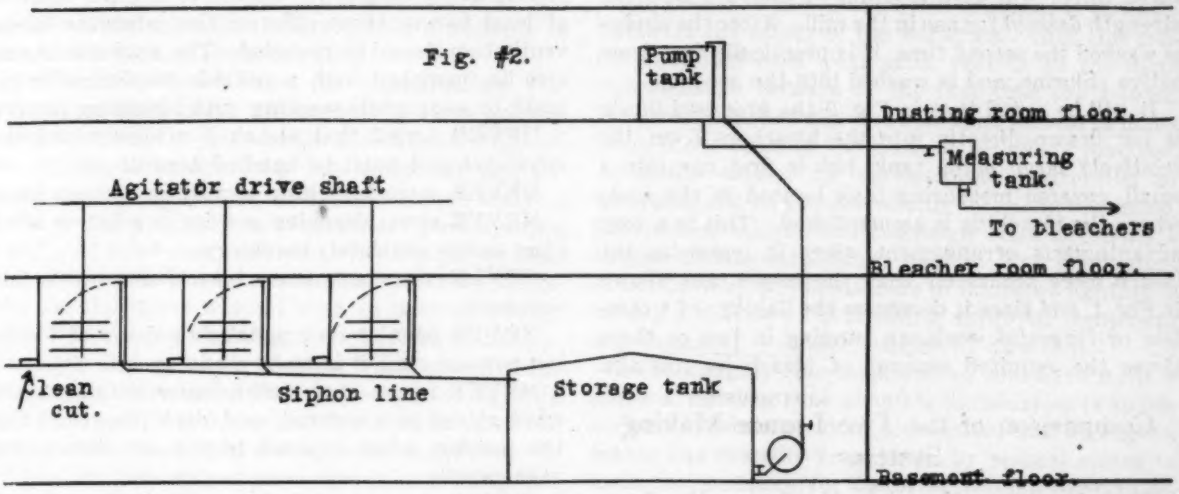
## Preparation of Bleach Liquor

The making of the bleach liquor is a relatively simple, but yet important matter. It involves stirring the powder up with water, allowing the insoluble matter to settle, drawing off the clear liquor and rewashing the insoluble matter or sludge to remove the last traces of active chlorine. In this operation the hydrometer can be used to advantage if due considerations are given to its limitation, and if the suggestions in the above paragraph are followed.

## Two Systems of Handling

In the accompanying sketch, diagrams of two satisfactory arrangements for making and handling bleach are given. System number one is operated as follows: One drum (about 700-800 lbs.) of bleaching powder, together with sufficient water (about 700 gals.) is dumped into the concrete mixing tank "A," which is provided with a circulating pump "B" and baffle plate "C," or some other suitable means of agitation. The mixture is then agitated vigorously as long as necessary (30-40 min.) and pumped over into the concrete settling tank "D," which should be large enough to hold a day's supply of liquor. After the insoluble matter has settled out, the clear liquor is drawn off through the siphon pipe "E" into the covered concrete storage tank "F." The sludge in the settling tank is run into tank "G," whence it is pumped back to the agitating tank "A" along with more water. After thorough agitation, the mixture is pumped into the sludge settling tank "K," and after settling, the clear liquor is siphoned down into the storage tank "F," where it mixes with the strong liquor previously drawn from the settling tank "D." In this way, liquor of about 5.0°Be' (.15 lbs. avail. chlorine per gal.) is obtained. The sludge remaining in tank "K" is practically free from active chlorine and is run into the sewer. In case it is not free from active chlorine, the sludge may be repumped into "A" as shown.

Fig. #2.




By means of pump "L" the liquor is forced from the storage tank to the covered pump tank "M" which is located slightly above the level of the bleachers. The liquor is drawn directly from this tank to the bleachers, and the amount drawn is measured by the float and indicator "N."

A less complicated, though clumsier method of making bleach liquor is shown in Fig. 2. In this system, the operations of agitating, settling, and washing are all carried out in the same tank. Since it is usually inconvenient, for various reasons, to agitate more than one or two drums of bleach in a tank at one time, it is necessary to provide at least two or three agitating units to effectually handle the bleach requirements of a one-machine mill, using old papers as the major raw material. A still greater number of agitating units must be provided if more bleach liquor is needed. The operation of the system is simple. The tanks

are filled, washed, and rewashed in succession, so that when one agitating tank is full of strong liquor, the second is full of medium strength liquor from the first sludge washing, while the third is full of very weak liquor from the second sludge washing. For example (see Fig. 2), a drum of bleaching powder is dumped into tank No. 1 and agitated with about 700 gals. of water. After the insoluble matter has settled, the clear liquor will test about 10°Be′. If this liquor is drawn off and the tank refilled with water, reagitated, and allowed to settle, the resulting liquor will test about 4°Be′. If this liquor is drawn off and the remaining sludge again washed, the resulting liquor will contain practically no active chlorine and will test about 1°Be′. Now, if things are so arranged that while tank No. 1 is full of strong 10°Be′ liquor, tank No. 2 will be full of "first wash" of 4°Be′ liquor and tank No. 3 full of "second wash" or 1°Be′ liquor, the mixing of the liquors from all three tanks will give a liquid of about 5°Be′, the strength desired for use in the mill. After the sludge is washed the second time, it is practically free from active chlorine, and is washed into the sewer.

It will be noted that in Fig. 2 the prepared liquor is not drawn directly into the bleachers from the relatively large pump tank, but is first run into a small, covered measuring tank located in the room where the bleaching is accomplished. This is a very advantageous arrangement, since it measures the bleach more accurately than the larger tank shown in Fig. 1, and since it decreases the liability of a careless or forgetful workman running in two or three times the required amount of bleach by mistake.

## Comparison of the Two Liquor Making Systems

The advantages of system No. 1 over No. 2 are about as follows:

1. The floor space per unit volume of liquor produced is relatively small in No. 1.

2. The extraction of bleach is much more complete in No. 1.

3. The output of system No. 1 may be easily and quickly increased or decreased.

4. System No. 1 is especially economical where a large quantity of liquor is required since it does away with several inconvenient and inefficient small, agitating tanks.

5. System No. 1 saves times, since settling takes place much more rapidly in a specially built settling tank than it does in the small tanks built for agitators.

The advantages of System No. 2 over No. 1 are as follows:

1. In a small mill, not requiring much liquor (1-2 machine mill), system No. 2 is simple, easily installed, and easily operated.

2. System No. 2 has very few rapidly moving parts to give out and cause trouble.

3. For small plants, system No. 2 is as efficient as No. 1, both in regard to power consumed and in liquor produced per pound of powder.

## Suggestions for Handling Bleach

The hints thrown out in the above paragraphs may be summed up briefly by the few following suggestions or "nevers," most of which are obvious:

NEVER expect a man to be efficient at making bleach liquor in a poorly ventilated room. The bleach mixing room should be exposed to air and light on at least two or three sides or else adequate forced ventilation should be provided. The workman should also be furnished with a suitable respirator or gas mask to wear while working with bleaching powder.

NEVER forget that bleach is a highly corrosive substance and must be handled accordingly.

NEVER store bleaching powder in a damp place.

NEVER store bleaching powder in a hot or warm place unless absolutely necessary.

NEVER store any more bleaching powder than necessary.

NEVER open or even puncture a drum of bleaching powder until it is to be made up into liquor.

NEVER forget that bleach liquor is fairly stable when stored in a covered, cool, dark place; but that the powder, when exposed to the air, deteriorates very rapidly.

NEVER store bleach or bleach liquor near machinery or fibrous materials for obvious reasons.

NEVER store bleach liquor in a warm place or in a tank that is uncovered or exposed to very much light.

NEVER store bleach liquor any longer than necessary.

NEVER fail to realize the importance of carefully measuring the bleach liquor as it is being used.

NEVER forget that the hydrometer reading isn't necessarily an indication of the actual strength of a bleach liquor.

NEVER fail to remember that bleaching and the handling of bleach liquor are important phases of the papermaking process and act accordingly.

# Illumination for the Papermill

By H. T. SPAULDING

*This Paper Was Presented at the Meeting of the American Pulp and Paper Mill Superintendents' Association, on July 31, at Green Bay, Wis.*

THE progress of Illuminating Engineering has been such during the last few years that it is doubtful at present if there is any one who has given the matter any thought who does not appreciate at least to some extent the need for and the economy of operation produced by satisfactory lighting in industrial plants. If in no other way, this is indicated by the changes which have taken place in building design. Where years ago but a small proportion of the wall areas was occupied by windows, at present it is customary to provide as much glass as possible in the walls and often also overhead skylights so that the illumination within a building is comparable with outdoor intensity.

On the other hand there are comparatively few among industrial plant managers, engineers and superintendents, who have made a sufficient study of the subject to realize fully how great are the advantages of good light, or to determine by an analysis of the conditions just what constitutes good lighting in any particular case, and also what equipment may be used to obtain it most economically. These, therefore, are the items which I wish to take up briefly.

The divisions on Lighting of the Section on Sanitation of the Committee on Welfare Work, prepared for the Council of National Defense, a code of lighting for factories, mills and other work places, in which the advantages of good light are set forth as follows:

While the necessity of good light is so evident that a list of its effects may seem commonplace, these same effects are of the greatest importance in their relation to factory and mill management. The effect of good light, both natural and artificial, and of bright and cheerful interior surroundings includes the following:

1. Reduction of accidents.
2. Greater accuracy in workmanship.
3. Decreased spoilage of product.
4. Increased production for the same labor cost.
5. Less eye strain.
6. Better working and living conditions.
7. Greater contentment of the workmen.
8. Better order, cleanliness and neatness in the plant.
9. Easier supervision of the men.

In this list it will be noted that Items 5, 6, 7, 8 and 9 have a bearing on accident prevention.

Mr. R. E. Simpson, of the Travelers Insurance Company, in a paper presented before the Illuminating Engineers Society on October 10, 1918, states:

A survey of 91,000 accidents from the records of the Travelers Insurance Company for the year 1910 showed that 23.8 per cent were due to improper or inadequate illumination.

The same authority explains that it is hardly possible that this percentage prevails at present due to the progress in illumination, but he goes on to say:

"There is some foundation, however, for assuming that 18 per cent of our industrial accidents are due to defects in the lighting installation. On that basis the services of 108,000 men for 1 year are lost annually, because the illumination provided is not adequate for the safety of the workmen. That this condition should exist year after year is all the more reprehensible because of the fact that the remedy is so easily applied and has beneficial results in many ways other than in the element of safety involved. Accidents caused by carelessness, inattention or ignorance can be eliminated only by a long continued, painstaking educational campaign often involving a change in long-established habits. The elimination of accidents due to inadequate or improper lighting is simply a matter of purchasing approved equipment and installing it under competent direction."

So thoroughly convinced are all who have made a study of lighting that adequate illumination is an important factor in accident prevention, that legislative action has recently been taken by several states to make it mandatory for factories to fulfill lighting requirements. The preface to the Wisconsin Industrial Lighting Code, signed by the Industrial Lighting Commission of that state, reads as follows:

### Why the State Regulates Factory Lighting

Insufficient and improperly applied illumination is a prolific cause of industrial accidents. In the past few years numerous investigators, studying the cause of accidents, have found that the accident rate in plants with poor lighting is higher than similar plants which are well illuminated. Factories which have installed improved lighting have experienced reductions in their accidents which are very gratifying.

Of even greater importance, poor lighting impairs vision. Because diminution of eyesight from this cause is gradual, it may take the individual years to become aware of it. This makes it all the more important to guard against the insidious effects of dim illumination, of glaring light sources shining in the eyes, of flickering light, of sharp shadows, of glare reflected from polished parts of the work. To con-

serve the eyesight of the working class is a distinct economic gain to the state, but regardless of that, humanitarian considerations demand it.

Finally, inadequate illumination decreases the production of the industries of the state, and to that extent the wealth of its people. Factory managers, who have installed improved illumination, are unanimous in the conviction that better lighting increases production and decreases spoilage.

Advocates of improved industrial lighting have for some years pointed out that among the marked benefits resulting from its adoption is the increase of production it brings about. This is a very telling point in including the factory owner or manager to become sufficiently interested in the lighting problem to order the installation of an up-to-date lighting system.

A great many factory executives are very conservative, however, and want to be shown. The question, then, is, how can this emphatic and clear argument be definitely brought home to them in the best way?

The answer has usually been that specific figures showing at least approximately what increase in production would result from lighting betterment were desirable, if not actually necessary. Foreseeing the value of such figures, a number of tests of production increase following lighting improvement have been made in several cities, but in no case had the matter been given consistent and persistent study up to within a year and the results announced from various tests have seldom included a full statement of the conditions under which the tests were made.

In Chicago four tests of the relation of lighting to production have been made during the past year that have aroused the greatest interest because of the care with which they were conducted and the conclusiveness of their results. These tests were directed by the Lighting Committee of the Commonwealth Edison Company and formed an important feature in a general shop lighting survey undertaken by this progressive central-station company of the plants of the larger manufactures served from its lines. Before advising greater use of light it was felt desirable to know the actual facts, to ascertain which the Chicago company undertook a series of tests to show the true relation between the amount of light used and the production of hand and machine workmen in various industries. The conditions to be met in the conduct of the tests were:

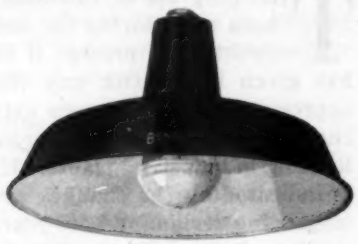
1. The plant should be able to show actual production accurately for distinct machines during definite periods.

2. The product should be so standardized that large outputs may be obtained with all conditions identical except the amount of light used.

3. A fair proportion of the work must be done during hours of darkness or the factory must be so placed that the daylight is negligible.

These are the ideal conditions. In no case was it possible to realize them completely, but in four instances data were secured which will interest all lighting men.

One test was conducted in a machine shop finishing iron pulleys, both large and small. The shop was some 40 by 80 feet in extent, giving an area of 3,200 sq. ft. As found, it was lighted largely by bare 60-watt lamps on drop cords, a few equipped with tin



shades of some of the cheapest varieties. The consumption of electricity in this lighting amounted to 0.27 watt per square foot with a very low resultant illumination, and a great variation in intensity in the various parts of the room. The windows were so few and so dirty that the daylight effect was almost negligible except on one or two machines.

This typical lack of lighting equipment was remedied by installation of Reflecto-Cap 200-watt units mounted some 10 ft. above the floor. The electrical consumption was increased nearly 7 times, the average illumination nearly 25 times. The Lighting Committee engineers prepared special forms for the use of the night foreman so that accurate record could be kept of every operation on every pulley machined, while the production record system of the factory gave similar data in a somewhat different form. From the two sets of records, the several operations were reduced to an actual basis of work done; from the size of the pulley surfaces, for example, the square feet of turning was computed. The work was done by the testing engineers from the viewpoint of the critical engineer looking for the fact, regardless of its implications, and their results may be taken as conservative. This increase in lighting gave increased production to the amount of 20 per cent if we take the testing engineer's records, or 35 per cent if we include the customer's own records in the total average.

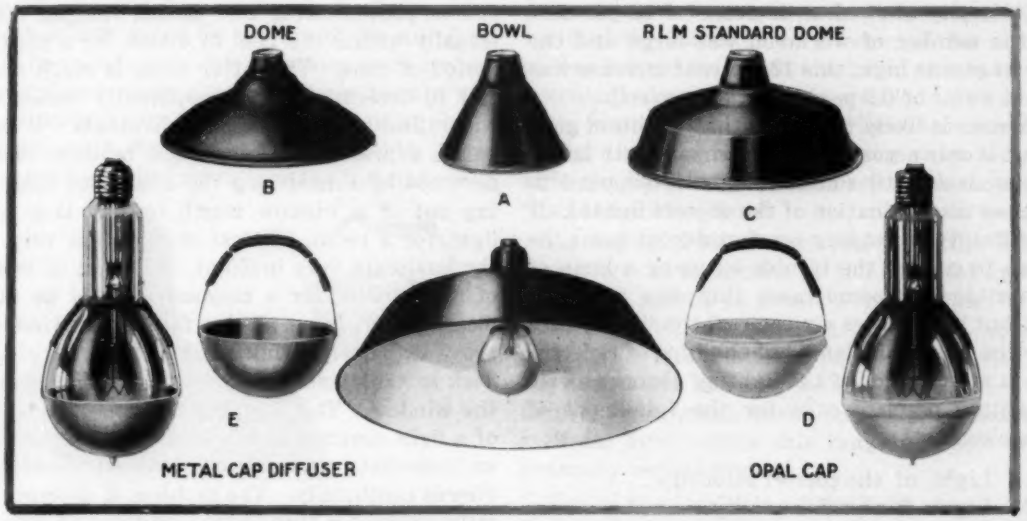
In this particular instance, allowing 20 hours per month of 50-cent labor for cleaning the units, taking into account the increased consumption of electricity at the particular rate which this customer earns in Chicago, assigning at least a 7-year life to the units, and capitalizing the investment at 6 per cent the total cost will approximate $105 per month, which is some 5½ per cent of the monthly payroll in this shop—from 20 to 35 per cent increased production at a cost of 5½ per cent of the payroll.

Another test was also made in a machine shop, in this case manufacturing soft metal bearings, both steel casings and the Babbitt lining. Here a fourth requirement was necessary for the test. It was to so arrange the lighting system that there may be secured the intensity which has previously been considered good practice from the same units used to give daylight intensity, the only difference between the two being in the size of the lamps. In this shop 25 deep bowl reflectors were equipped with 100-watt lamps to give just about the illumination that was obtained in the second part of the previous test.

1. The advantage of even fair lighting over that now obtaining.

2. The further large improvement in going from fair to excellent lighting. "In taking this last step," Mr. Durgin, who conducted the test, said, "we have increased production beyond anything before thought possible by merely increasing intensity, and we feel that we are justified, therefore, in speaking of the lighting level maintained as a true productive intensity."

Still another test, the machine shop work was done upon heavy steel parts used in truck bodies. The




*Industrial Lighting Fixtures Suitable for Use in the Various Departments of a Paper Mill*

This required a consumption of 1 watt per square foot. The shop was run with this equipment for one month, the management's regular records proving quite sufficient to show output accurately. The 100-watt lamps were then replaced by 200-watt gas-filled lamps, thus bringing the consumption to 2 watts per square foot. It was the intention to repeat this cycle, returning to the lower intensity for the third month, and finishing with the higher value during a fourth, but after the second month's experience using the daylight level, the management refused to return to normal, feeling that their production was of considerably more importance than the satisfaction of the testing engineer's desire to secure entirely unbiased data.

Comparing the two months, there is an increase of from 8 to 27 per cent under the high intensity lighting—an average for eight different operations of 15 per cent increase. If we keep in mind that the normal lighting in this case was of the value which showed at least 20 per cent increase over typical industrial conditions in the first test, we might expect from 40 to 50 per cent increase in a plant where the change was from the extremely low values, sometimes found, to the daylight level. We may think of possible increases, therefore, in two classes.

shop was some 2,400 sq. ft. in area, and this run also was made to compare a fair value with the productive daylight level. The same number of units, the same reflectors and accessories were used for each system, the only change being between 100-watt gas-filled lamps requiring a consumption of 0.6 watt per square foot and 300-watt consuming 1.7 watt per square foot. Here the work was so varied and the workmen so variable that it was found necessary to change intensities at short intervals, the test engineer himself keeping the records. His results might be open to question on the score of prejudice if it were not that he shows a considerably lower increase than was obtained in the two preceding cases where the customers' records were used.

Quadrupling the intensity gave from 6 to 14 per cent increase in three operations, averaging 10 per cent. The cost of productive intensity for this shop figures 1.2 per cent of the payroll.

In the last test quite different conditions were met with. The work was assembling carburetors, the operators handling small parts and making rather delicate adjustments. The management of this shop was of the most efficient, aggressive type.

They fully appreciated the need of plenty of light and had already installed equipment well above pres-

ent average practice. The old equipment used 100 Mazda lamps, principally of the 40-watt size and consumed 1 watt per square foot. For the productive intensity runs, the 100 units were replaced by 29, nearly doubling the consumption per square foot but increasing the intensity about six times.

Large parts of both the preceding test and this one were run after the signing of the armistice. In both instances, the concerns were affected by the prevalent uncertainty through which we have been passing, but even under such conditions and notwithstanding the previous efforts of this management to speed carburetor assembling to its maximum productive intensity showed an increase of 12 per cent and as the number of workmen was large and the average wage was high, this 12 per cent increase was secured at a cost of 0.9 per cent of the payroll.

The layman is likely to believe that to obtain good lighting it is only necessary to experiment with lamps of various sizes until sufficient light is supplied to permit close discrimination of the objects lighted. If he has difficulty in reading comfortably at home, he endeavors to correct the trouble by using a lamp of higher wattage; in some cases this may solve his problem, but the chances are the real trouble involves not only the size of the lamp but the type of reflector equipment and location of the lighting source as well. Good lighting practice calls for the fulfillment of three requirements:

1. Light of the correct intensity.
2. Light of suitable quality.
3. Correct arrangement and equipment.

Of these three requirements, the second must be discussed somewhat generally at present for the reason that sufficient data are as yet not available to permit definite conclusions to be drawn. As regards light intensity, values which are known to represent good practice can be readily tabulated to serve as a basis for individual requirements. Such tables are published by a number of manufacturers. Several States have also formulated codes giving intensities which should be used. It should be remembered, however, that states can only require an illumination which makes for safety to the workmen and cannot demand a production intensity, so that the values required by these codes are far below good practice.

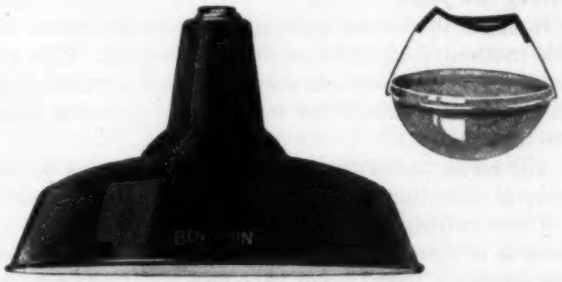
Any discussion of the quality of light leads invariably to a consideration of glare and color.

Glare has been rather loosely defined as light out of place. It has been more fully defined as any brightness within the field of vision of such a character as to cause discomfort, annoyance, interference with vision or eye fatigue. Always a hindrance to vision, it often, like smoke from a chimney, represents a positive waste of energy as well. It is one of the faults most commonly found in all lighting installations.

A glance at the sum proves that an extremely bright light source within the field of vision is capable of producing acute discomfort. Light sources of far less brilliancy than the sun, such for example as the filament of an incandescent electric lamp or the mantle of a gas lamp, are also quite capable of producing discomfort by direct glare, but the annoying effect is not usually so marked. From our present knowledge, it appears that there are at least two distinct brightnesses which are of particular interest in connection with illumination problems. The more definite of these two is the brightness at which a given source looks just uncomfortably bright when viewed casually against a background. The second, and much lower value, is the brightness at which a source proves tiring and causes fatigue when continually within the field of vision for a considerable period of time. The latter value is much more difficult to determine and it apparently varies through wider limits for different individuals. What these values represent may, perhaps, be more clearly understood by considering the analogous case of looking out of a window which by day is a source of light for a room. Unless the room is very dark or the landscape very brilliant, the effect of looking out of the window for a moment will not be at all unpleasant, but to sit all day facing the window would prove extremely tiring, even if one were sitting at a desk or table and not paying particular attention to the window. This is exactly comparable to the case of a light source which is not bright enough to cause an immediate sensation of glare but too bright to be viewed continually. The problem of determining definite values for these two conditions of glare is rendered extremely difficult because of the fact that the extent to which glare is objectionable is partially dependent upon the contrast in brightness between the light source and the background. This is illustrated by the fact that although automobile headlights, as seen at night against a dark background, are likely to be so glaring as to be temporarily blinding, the same lights would in the daytime hardly be noticed. The permissible brightness of a light source is greater when the general illumination is of high intensity than when it is of low intensity. That is, for a room which has dark walls and furnishings, a unit of lower brightness should be used than would be permissible in a well illuminated room in which the decorations are light in color. The permissible ratio between source brightness and background brightness is not, however, constant; the ratio must be smaller at high values of intensity than at low ones.

The glare from street lights is often scarcely noticed as one walks along the street, but if one sits on a porch facing a unit, the glare is likely to cause acute discomfort. Such data as are now available indicate ordinarily the brightness of a lighting unit which is in the central portion of the visual field should not exceed from 2 to 3 candles per square inch of apparent area, if that unit is not to give rise immediately to a sensation of glare, and the brightness

should be reduced to ½ candle per square inch of apparent area if it is not to fatigue the eyes when viewed continually. In this connection it is interesting to note that the brightness of the sky rarely exceeds 3 candles per square inch. A 200-watt Mazda C lamp in a 10-inch opal ball of medium-density glass will emit light at an intensity of about 180 candles (the opal ball so diffuses the light that the candlepower in all directions from the unit is approximately the same). The apparent area of a ball 10 inches in diameter is about 80 square inches, for as we look at such a ball from a distance we see a circular area of 80 square inches, which is acting as a source of 180 candles. In other words, the opal ball is a source emitting 2¼ candles per square inch of apparent area. Such a unit would be too bright for an office, but would be satisfactory for hallways, store rooms, and similar places which are used intermittently, and for a large proportion of stores and industrial plants where those using the illumination frequently move about and are not called on to face the lighting units



for long periods. If a 60-watt lamp were substituted for the 200-watt in the 10-inch ball referred to, the brightness would be reduced to slightly over ½ candle per square inch, and this would usually be the largest lamp that could be used in a medium-density opal ball of this size if all danger of glare were to be avoided with the unit placed in an office or similar location.

It is sometimes possible to improve poor lighting condition where the direct light from sources in the field of vision causes glare by changing the position of the sources. Little interference with vision is evident where light sources are 25 to 30 degrees away from the normal line of sight; but even when so located they are quite capable of producing eye fatigue if continually within the range of vision.

A form of glare which is often less obvious than that which comes direct from the source to the eye, but which is frequently more harmful because of its insidious nature, is that which comes to the eye as glint or a reflection of the source in some polished surface. This form of glare, known as specular reflection or veiling glare, is frequently encountered where the work is with glossy paper, polished metal or furniture, or other shiny surfaces and is particularly harmful because of the fact that the eye is often held to such surfaces for long periods of time, and while the glare may not be sufficiently annoying to be recognized as of a serious nature, it may be, nevertheless, in time produce eye fatigue or even permanent injury. Since the brightness of the reflected image is dependent upon the brightness of the light source, it follows that the harmful effects of specular reflection can be minimized, by reducing the brightness of the light source. Frequently specular reflections can be prevented from striking the eye by locating the light source in such a position with respect to the work that specularly reflected light will be thrown away from, rather than toward, the operator. The use of lighting units of large area and a diffusing medium to prevent any direct rays from the lamp striking the surfaces illuminated will aid in avoiding bad specular reflection, but on the other hand, if the source is very large, as, for example, a ceiling lighted by indirect units, a certain amount of specular reflection cannot be avoided. For a machine shop, a more highly diffusing light source will be required than for a wood-working shop because the reflected images from metal are much more distinct than those from wood.

As daylight intensities represent the standards which are to be sought in the artificial lighting of industrial plants, so does the color of daylight constitute the standard which should be approached in artificial illumination. Through centuries of use, the human eye has adapted itself to function best in natural light, which varies somewhat in quality, and artificial light within this range will also be found generally satisfactory.

Due to the fact that all the light rays are emitted by Mazda lamps, it is possible through the use of suitable screens to secure any color of lights desired. In general, the light of Mazda B or Mazda C lamps is satisfactory without any modification whatever. For many operations and in many locations, however, work can be expedited or wares more strikingly displayed if the artificial light supplied is a closer approach to natural light. One of the drawbacks to the use of light approaching daylight in color value—that of inefficiency—has been largely removed through the development of the Mazda C lamp which not only operates more efficiently than the Mazda B lamp, but provides light which requires less filtering for correction to daylight value. The Mazda C-2 lamp has the correct screening properties incorporated in the glass of the bulb; the light which is produced is of afternoon sunlight quality.

Under certain conditions, on the other hand, as in a foundry, the criterion for the choice of an illuminant from the color standpoint is the penetrating power of the light. The appearance of the sun through smoke, haze, or fog evidences the fact that light of the shorter wave-lengths, that is, the rays near the blue end of the spectrum, are absorbed or scattered, while those of the longer wave-lengths pass through. Hence, under such conditions, light in which red and yellow rays predominate is the most effective.

# The Relative Importance of Boiler Scale

By M. B. MILLNER

DURING the war when much stress was being laid on fuel economy, and the government was doing everything in its power to point out to the manufacturer ways and means by which his fuel consumption might be cut, much was written about scale.

The fuel administration refused a clean bill of health to the concern that could not show clean boilers. Prof. Schmidt of Illinois University made exhaustive tests to show the fuel losses due to various thicknesses of scale on the boiler metal.

This table is published here to emphasize once more the fact that even a thin deposit will cause a very definite fuel loss.

| Character of Scale | Thickness Inches | | Loss of Efficiency Per Cent |
|---|---|---|---|
| Hard | 1/50 | Mostly carbonate | 5.4 |
| Soft | 1/32 | Mostly carbonate | 7.2 |
| Hard | 1/32 | Mostly carbonate | 8.5 |
| Soft | 1/25 | Mostly carbonate | 8.0 |
| Hard | 1/25 | Mostly sulphate | 9.3 |
| Hard | 1/20 | Mostly sulphate | 11.1 |
| Soft | 1/16 | Mostly sulphate | 10.3 |
| Soft | 1/16 | Mostly carbonate | 11.0 |
| Soft | 1/16 | Mostly carbonate | 12.4 |
| Hard | 1/16 | Mostly carbonate | 12.6 |
| Soft | 1/11 | Mostly carbonate | 15.0 |
| Hard | 1/9 | Mostly sulphate | 15.9 |

What progressive, up-to-date manufacturer would tolerate a department in his plant that was showing a cost 16% above normal; and yet there are hundreds of plants that are operating their boilers with more than an eighth of an inch of scale in them.

The loss in fuel is not the only serious result of scale. The increased heat necessary to prdouce steam puts a tremendous strain on the boiler metal, very often resulting in blisters on the tubes, and a bagging of the shell. If this is allowed to continue an explosion is almost an inevitable result.

One need only read the power magazines from month to month to be convinced of the grave danger in neglecting to keep the boiler clean.

It is largely a matter of neglect, for scale is being eliminated in thousands of plants, either by precipitating the scale forming solids before they reach the boiler, or by the use of boiler compounds in the boiler.

The installation and upkeep of a water softening plant, together with the necessity for a supervising chemist to insure its successful operation, has made the cost of this method such that its use has been limited largely to those plants developing a very large horsepower.

This leaves a tremendous field for the boiler compounds, as there are almost no waters in these United States that do not form a scale of some kind.

The compounds are divided into two classes, those that treat the water and the socalled "metal treatments."

The principle of introducing a chemical or combination of chemicals into the boiler, there to mix with the water and precipitate the scale forming solids has been in use for many years.

They have not, however, been uniformly successful. One reason for this has been the fact that no two waters will show the same analysis, and the analysis of the same water varies at different times during the year.

In order to remove scale from the boiler metal, by this method, it must be eaten or rotted off. This requires the use of strong chemicals and a consequent care to see that the boiler metal is not corroded from the treatment.

The boiler metal treatments have only come to the general attention of engineers in the last few years.

Their principle of the removal and prevention of scale is in direct contrast to that of water treatment compounds. They do not take into consideration the condition of the feed water and are not influenced by its varying analysis.

They do not reduce the scale to a sludge, but remove it mechanically. The treatment working its way through the cracks and crevices in the scale, and coming in contact with the hot metal, expands greatly, prying the scale loose.

A coating is then formed over all exposed surface, preventing the scale forming solids from coming in contact with the metal and adhering to it.

This coating also prevents the corrosive elements in the water from attacking the metal.

Using either method the engineer should not attempt to dispense with washouts, especially when the scale is being removed. After his boilers are once cleaned the number of washouts can undoubtedly be considerably decreased.

Care should also be taken to blow off regularly, as this relieves the boiler of its accumulation of scale forming solids.

Many engineers make the mistake of leaving the blowoff valve open for too long a period, with a consequent reduction in steam power. A better practice is to blow off more frequently, opening the valve full, and closing immediately.

Whether you put in a water softening plant, use compounds that treat the water or the metal. You cannot afford to give up your fight against scale.

# The Coloring of Pulp and Paper

By OTTO KRESS
In Charge of Paper Section, Forests Products Laboratory, Madison, Wisconsin

*This Paper Was Presented at the Meeting of the American Pulp and Paper Mill Superintendents' Association on July 31, 1919, at Green Bay, Wis.*

THE dyestuff industry is directly related to about 20 distinct American industries, represented by 11,037 establishments with an invested capital of $2,530,200,000 and an annual production valued at $2,631,390,000. These industries give employment to 1,070,400 people. The paper industry is one of the larger consumers of dyestuffs, being represented by 495 mills employing 42,481 people, with an invested capital of $177,413,000 and an annual production valued at $158,427,000.*

In 1914 practically nine-tenths of the dyes consumed in America were imported from Germany. Further, such American plants as existed made only the simpler colors on which patents, mainly controlled by Germany, had expired and, further, made these colors to a very large extent from intermediates made in Germany. The higher grade of colors, such as indigo for example, were not produced in the United States previous to the War.

In 1914, on the outbreak of the War, the importation of German dyestuffs was restricted and ceased entirely at a later date. At once there developed an American dyestuff industry which today can supply practically all the dyestuffs required by the American dye consuming industries. It is, of course, true that some pre-war dyes are not obtainable at the present time, but these will be on the market in the not very distant future.

The American dyestuff industry, as it existed previous to 1914, had never received adequate protection, while in Germany it had been carefully fostered. The strides made in this country in dyestuff manufacture within the last few years are an achievement of which the American manufacturers and chemists can well be proud. As a typical example of this development, the DuPont Company has constructed an enormous plant at Deep Water, Del., at which over 200 chemists are employed on special dye problems. Probably the greatest individual achievement of this company is the successful commercial manufacture of American Indigo, equivalent in strength and quality to the best pre-war product.

Aside from the importance of an American dyestuff industry to the textile, leather, paper, paint, printing and other dye consuming industries to render them self-contained and independent of foreign manufacturers, this new American industry is of vital importance to our country along the following lines:

1. Direct relation of the dye industry to the manufacture of explosives and poison gas. In fact, the production of several of the dyestuffs, sulphur black for example, is very similar, in regard to plant and manufacturing processes, to the production of explosives.

2. Development and independence in the preparation of synthetic pharmaceutical coal tar products. The manufacture of these products is directly associated in many cases with the manufacture of dyestuffs.

3. Development of an independent synthetic coal tar industry to produce the needed supply of photographic chemicals, synthetic tanning agents, flavoring extracts, perfumes, etc.

4. The development of a specialized class of organic chemists who, together with the plants in which they operate, could, in case of a national emergency, be used for purposes of national defense. Further, the research work incidental to the operation and development of a self-contained coal tar industry will necessarily develop the whole field of chemistry from both the research and practical standpoints.

For information as to what has been done to date to safeguard this new industry, you are referred to the Report of the Alien Property Custodian on the Chemical Industry, by A. Mitchell Palmer.

Before the introduction of aniline colors, paper was colored by means of pigments, dyes of either vegetable or animal origin or by means of color lakes made from those vegetable or animal dyes. By lakes we mean compounds, either entirely or nearly insoluble in water, obtained by precipitating dyestuffs on bases by means of salts, acids, or bases. These lakes are characterized by greater tinctorial power or greater fastness than can be obtained from the original dyestuff.

During the early part of the war, the paper industry largely reverted to the use of pigments and lakes due to the shortage of aniline dyes. Vegetable dyes in the form of concentrated powders, pastes or lakes made from osage orange, fustic, quercitron, hypernic, black oak, logwood, etc., were largely used. These products are of very limited interest at the present time.

## Pigments

Pigments used in the coloring of pulp are of two types: namely, colored insoluble inorganic compounds

*Dyestuffs before the Ways and Means Committee, by J. Merritt Mathews, Color Trade Journal, Vol. 5, No. 1, p. 1.

such as lead chromate and insoluble organic compounds, such as the vat dyes which find application in the paper industry by being used as true pigments. This class of organic pigments will be described under the aniline dyes.

In general, the coloring of paper stock in the beater by means of pigments depends on the mechanical entanglement of the insoluble pigment with the paper stock, there being practically no direct coloring or absorption by the fiber of the colored pigment. The depth of the coloration of the paper, therefore, depends largely on the specific gravity of the pigment, the degree of sizing, the character of the stock (slow stock retaining larger amounts of the pigment than a free stock) and also on the type and operation of the paper machine. Strong suction either at the suction box or by the suction roll tends to produce a two-sided effect on the paper; that is, the wire side of the paper is more strongly tinted or colored than the top sides. With strong suction or with a free stock there is a tendency to lose a higher percentage of pigment in the back water, the pigment behaving exactly like clay or other loading material. Pigments, if used in large amounts, have a decided weakening action on the strength of the paper, acting in this way like ordinary loading materials. Pigments such as the ochres and the other earth colors should be tested for grit since, when used in large amounts, for deep shades, this grit may cause pin holes in the paper, resulting in the breaking of the paper while going over the machine. It also has a tendency to wear the felts and wires, and to scratch the calender rolls just as does a gritty clay when used for loading purposes.

Pigments, as a rule, are very low in tinctorial power. The following comparison will give some idea of the tinctorial strength of a few pigments in comparison with aniline dyestuffs, the tinctorial comparison being obtained by actual laboratory trials. Four hundred parts of turkey umber were matched with 100 parts of a fast aniline dye mixture or with 18 parts of a cheaper and less permanent basic dye mixture. Four hundred parts red oxide could be replaced with 84.4 parts of a fast aniline dye mixture or with 34.6 parts of a cheaper basic aniline dye mixture. Four hundred parts French ochre were replaced by 8 parts of aniline dye mixture while forty-eight parts chrome paste could be matched with 1 part of auramine conc.

Certain pigments, such as chrome yellow, are sensitive to heat and alkali, while others, such as ultramarine, are not very fast to acid (alum). Some of the pigments, such as red ovide, carbon black, etc., the pigments, such as red oxide, carbon black, etc., have other drawbacks. For example, carbon black is very fast, but has other drawbacks to its use, such as smutting. Furthermore, it is very difficult to handle in the beater room due to its low specific gravity and fine state of division.

Various Prussian Blues, both as pigments and in soluble form, are used quite extensively for the tinting and coloring of paper. Prussian Blues are fast to light, but very sensitive to alkalki.

## Aniline Dyestuffs

With the discovery of mauve by William Perkin in 1856, while experimenting on the possible production of quinine, there originated the synthetic coal tar dyestuff industry. Insofar as the paper industry is concerned, the aniline dyes are used almost exclusively for the tinting and dyeing of the pulp and paper.

The aniline dyes have the following decided advantages over pigments and natural dyestuffs: (1) Great tinctorial power. (2) Ease of application and uniformity of the product both in shade and strength so that the dyeing of the pulp or paper is very much simplified. (3) The dyestuffs now available cover every range of color and shade and can be chosen according to cost, tinctorial power, resistance to various factors, such as fading, alkali, alum, etc. (4) The aniline dyes do not decrease the strength of the dyed sheet, as do pigments.

## Nomenclature of Dyestuffs

The same dyestuff was often placed on the market by various manufacturers, each using his trade name o identify the dye. For example, the Vesuvines, Bismarck browns and Manchester browns were practically identical, but were sold under these various trade names. The DuPont Company will place their acid dyes on the market under the trade name "Pontacyl," used as a prefix to the name of the dye. In similar manner the trade name "Pontamine" designates the substantive or direct cotton class of dyestuffs, "Ponsol" will be used as a designation for the vat dyes, and the basic dyes will have the trade name of DuPont prefixed to the actual name of the dye. The National Aniline and Chemical Company has adopted the prefix Erie or Niagara to designate their direct cotton dyes. The examples given show clearly the importance of the consumer familiarizing himself with the various trade names adopted by different manufacturers for the same product.

Further, some confusion exists in regard to the letters or designations added to the dyestuff. As the manufacturing process involved in the production of dyestuffs becomes more standardized and intermediates are obtained in a purer and more concentrated form, it is possible to produce more concentrated brands. In general, the terms conc. or X, as for example, Victoria Blue BX or Victoria Blue B Conc. means that these products represent the stronger brands of the dyestuff. The letter R usually indicated reddish shade, G, yellowish, and B a bluish shade of the dyestuff.

Dyestuffs, with very few exceptions, are never placed on the market as 100 per cent pure dyestuff, but are always mixed with salt, Glaubers salt, soda ash or other diluent. This dilution cannot be con-

sidered as adulteration, as it is impossible to control the complex organic reactions involved in dye manufacture so as to obtain a 100 per cent yield of the dye. Each batch of dye as produced at the plant, therefore, varies in tinctorial strength and the dye plant, after careful testing, dilutes the charge with some diluent, such as salt (the choice of diluent depending on the particular dyestuff) in order to produce a standard brand of the particular dyestuff. Naturally, unscrupulous dealers occasionaly adulterate with an excess of diluent, but the consumer, if at all experienced in dye testing, can readily determine such adulteration.

Many of the dyes on the market have admixed with them slight additions of other dyes used to shade the mixture to the desired standard shade. Other dyes are mixtures of two or more dyes, mixed for the purpose of producing a definite new color. Such mixtures or the addition of a shading dyestuff can readily be detected by blowing a small amount of the dye held on the tip of a knife blade on to a sheet of wet filter paper. Each individual dye in the mixture will dissolve to produce a differently colored spot. In general it is desirable to avoid purchasing mixtures of aniline dyes as the tendency for variation in shades due to variation in specific gravity of the admixed dyes often cause a decided difference in color. By separation of the heavier and lighter dyestuffs (due to difference in specific gravity) the first and last sample drawn from a keg or barrel of dyestuff will sometimes show a variation in color. The average paper mill should not require more than a dozen standard colors for the production of all of the current shades and should, if possible, avoid the use of mixtures of dyestuffs.

## Classification of Dyestuffs

Dyestuffs are not classified from the standpoint of practical application according to their chemical formula or derivation but rather into large groups according to their general behavior. These divisions are:

1. Basic Dyestuffs.
2. Acid Dyestuffs.
3. Substantive Dyestuffs.
4. Pigment Dyestuffs and Vat Dyestuffs.

The basic dyestuffs appear on the market in the form of salts such as the hydrochloride, acetate, oxalate, nitrate, double zinc salts, etc., of certain color bases. The basic dyes are characterized by great tinctorial power, but as a class are not fast to light. All basic colors can be mixed and dissolved together but should not be mixed or dissolved with acid or substantive colors as they would thereby be precipitated as color lakes and the color not only wasted but the precipitated dye would be apt to produce color spots on the finished paper. Basic dyes are very sensitive to hard water containing bicarbonates of lime or magnesium or any free alkali which tend to precipitate the free color base. This is often the source of color spots on the finished paper. Alkalinity of the water can be rectified by the addition of acetic acid. Solutions of basic dyes should not be boiled and they are best dissolved at temperatures not to exceed 180° F. Auramine is particularly sensitive to heat, and therefore should not be dissolved at temperatures to exceed 160° F. When dissolving mixtures of dyestuffs, and especially with basic colors, care should be taken that all of the component colors are completely dissolved to avoid variations in shade. Further, it is good practice to strain the solutions through a fine sieve. The writer realizes that the majority of mills do not dissolve their dyes but sprinkle them into the beater in the dry state; better results, however, are obtained by dissolving the dyes.

Practically a complete line of basic colors of American manufacture is now available to the paper industry. Some basic colors have a tendency to mottle unbleached sulphite pulp in the dyeing of a mixed ground wood—sulphite furnish, either first dyeing the ground wood alone in the beater then adding the sulphite, or adding the color in diluted form will overcome this trouble.

In general, acid colors appear on the market in the form of a salt of some color acid. The most characteristic property of acid dyes is that their tinctorial strength must be developed by acid which in the coloring of pulp in the beater is accomplished by using a slight excess of alum. The acid colors, as a class, are of lower tinctorial strength than the basic colors, but are faster to light. Acid colors can be mixed with the substantive colors without the precipitation of a color lake occurring but cannot be mixed with basic dyes. This class of colors, similar to basic colors, are in mill practice added in the dry form to the beater. Better results will be obtained if the dyestuffs are dissolved. Acid dyes are not very sensitive to heat and can be dissolved at a temperature a little below the boil. These colors are not particularly sensitive to alkalinity of the water due to calcium or magnesium bicarbonate, but some colors are precipitated by dissolved calcium sulphate as the insoluble calcium salt of the color acid.

To increase fastness to light and to obtain deeper and more brilliant shades, pulp is sometimes dyed with a bottom of acid colors and topped with a basic dye to obtain a full shade. This color lake of acid and basic color produced makes a fuller dyeing than can be obtained by acid colors alone, and is cheaper than if acid colors were used; the dyed paper will be more light resistant than if it were made from basic dyes. Practically the complete line of the pre-war acid colors suitable for the dyeing of paper is now available through the development of the American dyestuff industry.

The substantive or direct cotton dyes are salts of color acids which do not require acid (or in the paper industry, alum) to develop their tinctorial power. As a class, substantive colors are of lower tinctorial pow-

er than acid or basic colors, but those that find application in the paper industry are faster to light and other agencies than either of the other two classes. Substantive colors are somewhat sensitive to hard water, some of the colors being precipitated in the form of insoluble lime or magnesium salts. Substantive colors have the property of dyeing cellulose directly without the addition of any mordant or fixing agent. This class of colors is, therefore, largely used to dye unsized blotting and the colored stock as used in the manufacture of mottled papers. The substantive colors as a class are also remarkable in that they give practically colorless back waters, especially if the pulp is warmed in the beater preliminary to dyeing and if some salt is used to assist in the dyeing. Many of the more important direct cotton colors are now available to the paper trade.

The pigment and vat dyestuffs are synthetic organic dyestuffs, which insofar as paper dyeing is concerned are used in the form of insoluble pigments. These products as a rule, due to expense, are only used in the tinting of high grade paper or for producing light colored shades. The importance of these organic pigments lies in their great resistance to light and other chemical agencies. The pigment and vat dyes are not as yet available in commercial quantities, but the research and development work has been completed in so far at least as one American manufacturer is concerned and plants are now building for producing some of these colors.

## General Notes on Coloring

Paper may be colored by dyeing the pulp in the beater or coloring the paper in web form on the calender. As over 95 per cent of all paper is colored by dyeing in the beater, calender coloring will be considered at a later date. Coated paper, coloring on the paper machine by passing the paper through color boxes or producing paper specialties by foam and spray dyeing are of such minor importance that they will not be considered.

In the matching of any dyed shade the first consideration is the character of the stock, finish and class of dyestuff to be used. General experience will usually determine the furnish of the stock to be matched. If not, a little practice with the microscope will enable anyone to identify and roughly estimate the percentage of various stocks to be used in the furnish. If the sample to be matched is calendered heavily, then the sheet is to be steamed for a few moments in order to remove the finish, so that the true color of the paper can be noted. Allowance must also be made for the darkening of the shade if the sheet is to be water finished. It is advisable in matching any new shade or in making runs, even if a formula from a previous run is available, to start the color matching in daytime, so that the paper can be judged by daylight. The various daylight lamps in the market are valuable for matching shades, but daylight is to be preferred. The changing of colors under artificial light is well known to all beater men. Dyed shades containing much methyl violet, as, for example, blues made from methyl violet and a basic green, are very difficult to match and hold to shade on the machine under artificial light. The paper industry does not make use of mordants similar to the leather, textile and other dye-consuming industries to combine with the dye so as to make a color lake to increase the fastness of the dyeing. There are, of course, certain exceptions, such as the eosines, phloxines, rose bengals, and erythrosines which are usually after-treated in the beater with lead acetate in order to improve their brightness and fastness. Similarly, certain direct blues are decidedly improved, in so far as fastness to light is concerned, by the addition of copper sulphate. There is no question but that after-treatment of the dyed stock with the proper mordant would, in many cases, improve the fastness of the dyeing. This would be especially true if the basic dyes were after-treated in the beater with tannic acid or some cheap extract containing tannin.

Considerable controversy exists as to the proper order of the addition of color, size and alum to the beater. The writer believes that with very few exceptions the dye should be added first and after mixing with the pulp the size is to be added and then the alum. With all of the different classes of dyestuffs comparatively little difference would be made by varying the order of addition excepting for the basic dyes. In this case the addition of alum to the dye before the rosin size was added would tend to precipitate the free color base, possibly producing a spotted sheet of paper. With each individual color, the advice of the manufacturer on this point would give the proper procedure.

The kind of stock used in the furnish has a decided influence on the brightness and depth of shade obtained. In general, the more impure the fiber, the deeper and duller will be the resulting shade. Unbleached sulphite pulp, for example, will give a deeper but duller dyeing than is obtained by using the same percentage of dye on bleached sulphite. Jute, which contains a percentage of tannin-like material, has a strong affinity for basic dyes.

The pulps obtained from different cooks from the same digester will often show a decided difference in the way in which they dye. It may, therefore, be advisable to store the hard or raw cooks that may be produced by the pulp mill and use the pulp of the same quality for one paper machine run.

Hydration of stock by beating has a decided effect on the depth of the dyed shade. Glassine stock, for example, requires only a small percentage of the color to dye it to the same shade as would be required to dye the unbeaten stock.

Naturally, the quality of the paper largely determines the class of dyestuff to be used in tinting or

(*Continued on page* 361)

# What Kind of Lime Do You Use?

## Why Not Assist in Drawing Up Standard Specifications?

DO you buy it from a certain lime producer as a matter of habit, or do you buy it on specifications gotten out by your chemist? If in the first class, how do you know that the lime you are using is the best you can get, or even the cheapest you can get? If in the second, how many lime producers can you get to bid on your contracts?

I once asked a glass manufacturer to show me his specifications for lime. After examining them, I inquired where he was able to get such lime. He answered, "We don't get it." This is not the chemist's fault. Having at heart the best interests of his employer, he writes specifications for the kind of lime he wants rather than the kind he can get. This means that either the specification is a dead letter, or else only a few or no lime producers are willing to bid on furnishing the quality of material asked for.

If the lime producers know that a certain quality of lime is invariably demanded by the paper industry, they will produce that quality, if at all possible. As the consensus of opinion may differ from the individual opinions, so the combined best thoughts of all paper and pulp manufacturers may differ from your individual ideals. When these thoughts are combined and publicly expressed, you may find that the lime in your back yard is just as good as that which you are now buying around the corner.

When these thoughts are publicly expressed and agreed to by all parties, they constitute Standard Specifications.

Standard specifications are particularly valuable when they concern articles of minor importance. They eliminate the necessity of drawing up your own specifications. All you have to do is to advertise that you are in the market to buy so many tons of class A lime; please send in your bids. Your chemist has probably neither the time nor the inclination to keep a close check on your lime. He has other things to do which are of far greater importance. With a known specification to meet, the lime producer would see to it that his product was always up to standard, and it would be necessary for your chemist to check him up only at irregular and infrequent intervals.

During the War, Mr. Catlett, the Chairman of the Chemical Lime Division of the War Industries Board, noted that some pulp and paper manufacturers were using quicklime, some hydrate, some limestone; some were using high calcium lime, some magnesian lime. This frequently led to long freight hauls when lime of a different quality could be secured close by. In view of the then (and pending) scarcity of cars, this condition was serious.

Mr. Catlett's investigations of this and similar conditions led to the development of a Conference on Chemical Lime. As a sub-committee of this Conference, Messrs. Durgin and Emley, Chiefs of the Paper and Lime Sections, respectively of the Bureau of Standards, were delegated to prepare specifications for lime for use in the paper and pulp industries. Mr. Durgin was to collect information from the paper and pulp manufacturers as to the quality of lime they want. Mr. Emley is to place this compiled information before the lime manufacturers to see how nearly the demands can be met. In case of dispute, the Conference is to act as arbitrator.

The next meeting of this Conference has been called for August 12, to consider specifications for lime for use in cooking rags. These specifications are a compilation of the data obtained from users of the material. If it is found that the users are in substantial agreement, these specifications will be presented to the producers of the lime for criticism.

Before they are endorsed, the specifications will be published to invite criticism. In the meanwhile, suggestions and discussions will be gladly received and attentively considered.

Mr. F. A. Curtis has succeeded Mr. Durgin as Chief of the Paper Section, of the Bureau of Standards, and is now actively in charge of this work.

# Straining a Gnat

By WILLIAM A. NORMAN

NEVER in the history of the world was one man or set of men so dependent upon another. Not even is our own, the most nearly self-supporting among the nations of the earth, independent of all other nations under the present system. Our large centers of population are entirely at the mercy of the farmer, miner and shipper. Our food and clothing which we formerly provided by our own individual efforts, now come to us from every corner of the earth through the hands of several hundred artisans, disciples of efficiency, at a lower cost than they could possibly be provided now under the old system. Such efficiency is impossible without harmony. The very foundation of efficiency is cooperation. One department may run counter to the system for a time with the result that a sudden temporary advantage may be gained, but in the end the organization is disrupted and all, including the aggressor, must suffer. This is an invariable rule in every department of our industrial life.

## Cooperation Necessary

Under the caption "Suppose we all quit our jobs," suggested by John J. Mitchell, a Chicago banker, recently, in commenting upon the arbitrary and manifestly unfair attitude sometimes shown by one branch of society toward another, the Daily News (Chicago) said editorialy on July 21st: "The essentially cooperative nature of modern industry is not sufficiently appreciated by the average individual. Too many persons fail to see that in crippling industry or interrupting its normal processes they inflict serious injury upon themselves as well as upon others. Too many persons see superficial conflicts of interest and do not discern the fundamental harmony of interest underneath . . . . If, however, one element may act arbitrarily and irrationally, why should not other elements do the same?" Who, today, could estimate the cost of a book, for instance, if a single crew must fell the tree, grind the pulp, make the paper and print it and bind and deliver the finished book?

## Specialization

"A Jack of all trades and good at none" cannot hope to become skilled to any appreciable extent until he specializes in one particular line, when he ceases to be a Jack of all trades. The greater the concentration of effort, the higher the attainment and, in like proportion, the greater the dependence on all the other branches and supply lines of the system. Such an intensive chain of operation depends equally for its success, upon the strength and loyalty of each link. Each mill or factory is as truly a link in our industrial chain as each department of a paper mill or printing plant is a link in the chain of the organization of that plant, and the general economic responsibility of the larger unit is none the less.

## Mutual Interests of Maker and User

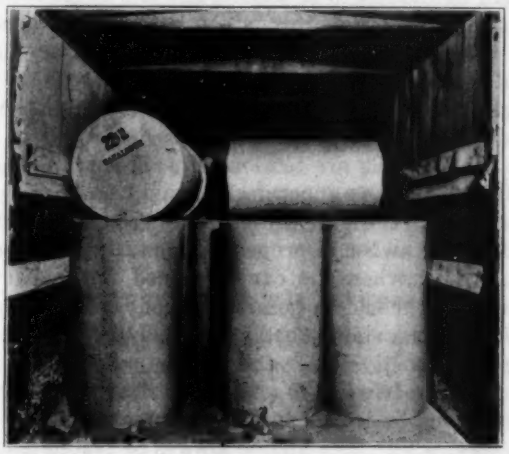
The successful paper maker must make it his business to acquire some knowledge of the demands that his paper will meet at the hands of the printer and the printer should make it his business to familiarize himself to a certain extent with the difficulties which the paper maker confronts in the making of paper, in order to know what it is reasonable and fair to demand. Intensive efficiency is demanded in this day of sharp competition. It is necessary, but must be fair. It must be tempered with co-operation and reciprocity. The efficiency of one department must not work a hardship on any other department and, to make a broader application of the principle, it is manifestly unfair for any branch of the paper and printing industry to foster a system that will yield to itself only a tithe of the expense imposed upon another branch of the industry as the result of such a system. The industry is greater than any part thereof.

## Storage

Efficiency is often a misnomer. An accompanying illustration shows unprotected rolls of paper stored in a warehouse on a main aisle where trucks pass frequently. Practically everything received for

storage in this building is trucked through this main aisle. Some of these rolls were so mutilated by passing trucks that the damage sustained was approximately five dollars each. These rolls were stored in

aisle space in the cause of efficiency—blind efficiency. One such roll occupied about six feet of floor space rated at thirty cents a foot, yielding the warehouseman a gross annual income of one dollar and eighty cents, or five dollars and forty cents in three years. These rolls were stored in this location about a month, hence in an effort to save thirty cents he has sus-



tained a loss of five dollars, the total gross income from the occupied space for nearly three years.

## Perfection

Errors are excusable only when we profit by them, and we should be enabled to profit by the errors of others as well as those of our own commission, and vice versa. This can be accomplished only through cooperation and the dissemination of our errors as a warning to others, as well as our knowledge for their education. No man expects perfection, but every man has a right to demand improvement if he is willing to lend a hand in its accomplishment. There is no perfection. We use the word in a comparative sense only. When a thing attains such an advanced state of superiority that, by comparison, what formerly was an accepted standard is conspicuous by its inferiority, and we are unable to find any basis for criticism, we follow a natural inclination and term it perfect. In the course of evolution and advancement, we attain what we call a higher degree of perfection and what we had called perfect becomes only commonplace. Soon the new standard fails to satisfy and improvement is demanded. If it were not so there would be no advancement and education would have no place in our system.

The modern machine that we look upon with awe and wonderment is not the practical application of a single idea of a single mind, but a consummate embodiment of many ideas of many minds, through a long period of development and evolution, each in succession assisted or impregnated by one or more previously applied. When all are practically assembled into one homogeneous working unit, we call the result marvelous, unless we have carefully followed each stage of development, in which case we can see only an inevitable result of natural growth and development, forced by the demand of necessity, and, in an attempt to justify our lack of enthusiasm, nonchalantly remark, "Necessity is the mother of invention." Those, who are absolutely impervious to influences that ordinarily thrill a normal person, lend little or no assistance in our efforts to approach the goal of perfection.

Even perfect and harmonious cooperation and the give-and-take principle, applied with scrupulous regard for the spirit of the golden rule, will not assure one hundred per cent production. There are so many opportunities for leakage, that every operation must be watched with the greatest care. A saving that might seem trivial and unworthy the effort, if effected at each opportunity, would, in the aggregate show a vast saving and would not infrequently return a fair profit on a given job which otherwise might have shown a loss.

## Responsibility

While they can not escape responsibility in their respective turns, the printer, the warehouseman and the carrier are handicapped, if the manufacturer fails in his plain duty to see that his paper is properly packed and loaded with every guarantee that he can afford, that it will arrive in good condition, if all subsequent handlers exercise proper care. If such precaution is diligently observed by each successive handler, the entire responsibility is finally passed on to the user, whereas, if a small amount of damage is sustained at each operation the result is serious and the responsibility difficult, if not impossible to place.

## Well Begun—Half Done

The most important stage of any undertaking is at the beginning. While a bad start is not always fatal, it never ceases to be a handicap. The first responsibility necessarily rests with the manufacturer, who is as much concerned with the proper packing and loading, as with the making, of his paper, as all his care in manufacturing might be brought to naught by improper packing and handling. The accompanying illustrations show some of the penny wise and pound foolish methods that almost invariably bring grievous results, as well as some precautionary measures which are just as important with the manufacturer as the press "make-ready" is with the printer, or the foundation is with the builder. Why will a printer sometimes spend two days on the "make-ready" of a job that requires less than a day to run? Certainly not for fun. It is because the truth of the aphorism, "Well begun, half done," will not down. The "make-ready" for the proper shipping and handling of paper is the paper mill's job and can not be delegated.

## Careless Bracing

The picture of the mutilated roll in the doorway of a car is an excellent illustration of the serious re-

sults of a little carelessness. As this roll was lying on its side in the upper tier with enough play to permit it to roll slightly back and forth with the swaying of the moving car, it was constantly rolling away from and against the sharp corner of the timber across the doorway, which sheered a few sheets with each contact, until about two hundred pounds of paper was reduced to waste. With this exception the contents of the car were in good condition. If this

timber across the doorway had been placed about four inches lower, it would have contacted with the roll at its center, instead of at the sharp corner, and no damage would have resulted, and the expense to the loader would have been no greater. This is conclusive proof that better loading does not always imply greater expense. Sometimes better loading can be accomplished with less expense.

This is especially true when unnecessary timbers are placed in such a position that they cause damage, which otherwise would not occur. All timbers should invariably be padded with paper at the point where they contact with the rolls, and such padding should be tacked or otherwise secured in position.

## Inspecting the Car

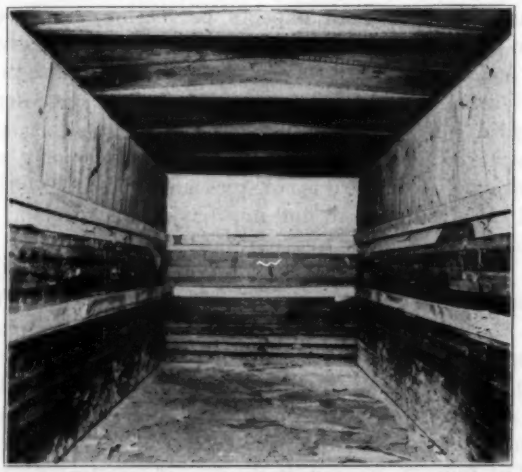
The first step in loading a car is inspection and preparation. If not suitable for the transportation of roll paper, it should be rejected. If rejection is not compatible with existing railroad conditions, or the supply of proper equipment, a representative of the railroad should be called upon to inspect the car and pass upon the advisability of loading it, in which event the responsibility for safe and proper carriage would devolve upon the railroad company.

## Preparing the Car

Referring again to the illustrations you will note the interior of an empty car, and the interior of the same car partially loaded. Note, in the former, the two lines of padded six-inch strips completely around the walls, and the heavy paper covering the floor. The position of the strips is determined by the length of the rolls to be loaded. This car is prepared for double-deck loading, the lower strips being placed at a distance from the floor equal to three-fourths the length of the roll to be loaded, and the upper strip in the proper position to contact with the centers of the rolls lying flat and constituting the upper deck. The illustration shows one row crosswise, and one lengthwise, which peculiar condition is due to the relation of the length of the rolls to the width of the car. If the rolls are too long for this arrangement, all the rolls of the upper deck should be loaded crosswise, except those in the doorway, which should be loaded lengthwise, in proper position to roll out from either side, when the car is opened for unloading. However it is seldom possible to double-deck rolls of such size, as a single deck will usually utilize the full tonnage capacity of the car. If the rolls are not too long to place two end-to-end across the car, the upper deck should be loaded in this manner, except in the doorway, where they should always be placed lengthwise ready to roll out with the least effort, and with the least danger of becoming so securely wedged in, that they can not be removed without damage.

## Double-Decking and Railroad Claims

Under normal conditions double-deck loading of roll paper can not be too vigorously discouraged, except, where the rolls are short enough to load both decks on end, and two rolls can be handled end-to-end as a



single roll. The double-decking of the larger rolls is a war measure, and was instituted as a patriotic duty on the part of the paper mills, in compliance with a request from the Federal Government, made necessary by the abnormal demand upon the inadequate equipment of the railroads, and should be discontinued as soon as conditions will warrant. It has been an expensive practice, not alone because of the addi-

tional expense of loading and unloading, but more especially because of the almost certain damage resulting from such loading, for which the carriers almost generally disclaim responsibility. There are today in the files of the railroads many claims for damage due to such loading, and nothing else, in amounts in excess of the freight charges, if which were paid, each transaction would show a net loss to the carrier, if not a dead loss to, or, if you please, a penalty for patriotic service and co-operation on the part of the shipper. The inevitable conclusion is, that, when a car is loaded with roll paper standing on end in single deck to the full floor capacity, except as noted in the case of very short rolls, which can be handled safely in gangs of two, such a car is loaded to its full capacity for this commodity, regardless of its rated tonnage capacity.

## Precaution versus Insurance

Insurance is precaution delegated and paid for. Precaution often entails no expense, while insurance is a paid servant. The more we do for ourselves, the better it is done usually, and the less there remains to hire done, and vice versa. If "an ounce of prevention is worth a pound of cure," we must concede a like relation between precaution and insurance.

## False Economy

An extra dollar spent in handling, loading and unloading may be the means of saving an amount ten times as great at destination, to say nothing of the advertising value of the demonstrated ability to accomplish delivery without damage. Without discounting in the least the unquestioned worth of judicious advertising, it can be safely stated that a vast sum so expended will often fail to repair the damage, caused by an attempt to save a pittance in precautionary expense.

The inevitable conclusion, and proven fact, is, that the manufacturer, shipper or printer, who omits a little extra care, or evades a little extra expense in packing, shipping or handling paper, is laying up trouble for himself or someone else. Almost invariably he is straining at a gnat and swallowing a camel.

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(*Continued from page 356*)

coloring. It is self-evident that newsprint paper need not be colored with as permanent a dye as would be used in the coloring of a high grade bond paper.

All of the larger dyestuff concerns maintain color laboratories and experienced technical men to match shades at the mill. It is advisable, in submitting a sample to be matched, to send some of the stock from which the paper is to be made. It is the writer's experience that laboratory dyeings can safely be reduced in quantity 20 per cent in the mill and it is advisable to color the first beater by reducing the amount of dye used by 20 per cent of the amount indicated by laboratory trials. It is always easy to add color, but it is a difficult matter to allow for over-colored stock.

After hand sheets made from the colored pulp indicate that the stock is properly colored and subsequently the paper as it comes from the machine shows the shade to be slightly off or too weak, then the pulp may still be brought to the desired shade by the addition of a solution of the necessary color to the stock in the chest. In case the paper should be deeper in shade than the sample to be matched, then the only remedy is to drop a beater of less colored pulp and mix the stock in the chest with the expectation of lightening the final shade.

As already mentioned, calendering and supercalendering and water finishing have the effect of darkening the sheet, and allowance should be made for the deepening of the shade by the calendering or other treatment.

The paper mill should be equipped with a color testing laboratory for the identification of the colors, and also for the determination of the strength and quality of the dyes used at the mill. Valuable results can be obtained by color matching, with consequent saving in cost by studying various dye combinations to produce a given effect. Further special studies can be made to determine the resistance of various dyes to fading: the effect of the acid on the color in parchmentizing; the effect of zinc chloride in vulcanizing, etc.

In conclusion, the American dyestuff industry is at the present time supplying the needs of the pulp and paper industry. In the not distant future there will be available a complete line of colors of all classes equivalent in strength and shade to the best pre-war products. Only by adequate protection and a sympathetic understanding of the difficulties to be encountered will it be possible to make America independent in so far as the development of a synthetic coal tar dyestuff industry is concerned.

# American Pulpwoods

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THE Forest Products Laboratory, Madison, Wis., has in the past received frequent requests as to the suitability of various woods for pulp and paper production, and it has therefore seemed advisable to prepare for publication some of the available data on this subject. The laboratory has carried on an extended investigation over a period of more than ten years and has collected experimental pulping data on practically all the possible species of American pulp woods. These data, in so far as the chemical pulps are concerned, have mainly been obtained from experimental cooks made in the Forest Products Laboratory, Madison, Wis., in 100-pound semi-commercial digesters, and from studies made on the resulting pulps. It has been found, however, that the general cooking conditions, yield, bleach, consumption, etc., as determined by experimental trials for pulp made from any given wood, compare quite favorably with the results obtained in commercial practice. The data for the various mechanical pulps were obtained from the experiments carried on at the ground-wood laboratory, Wausau, Wis., where a commercial-sized grinder equipment was installed by the Forest Products Laboratory in co-operation with the American Paper and Pulp Association.

The yield of pulp from any given wood depends directly upon the specific gravity of the wood or weight per cubic foot, and the pulping method employed. By varying the severity of the pulping treatment, both yield and bleach consumption are changed. For example, white spruce sulphite pulp prepared for the manufacture of newsprint paper would show an entirely different yield and bleach consumption from bleached white spruce pulp prepared for use in a white bond paper. It is, therefore, evident that the character and use of the pulp will largely decide the severity of the cooking operation. Certain woods, such as western larch, containing a high percentage of galactan, which is water-soluble, will show a decreased yield by either mechanical or chemical pulping.

Pulping data have been given for woods such as red and white oak, white ash and certain other woods not because we consider these species suitable for pulp purposes, but because the information was available. Many wood-using plants produce considerable tonnage of slabs and mill waste of woods not especially suitable for pulp production, and are interested in a possible outlet for this waste. In some cases, at their direct request, pulping trials have been made on woods known to be unsuitable for pulping purposes. The various woods have been listed, giving the official name as recognized by the Forest Service, also the common names in use and the range covering the growth of that particular species. This information has been taken directly from the "Check List of the Forest Trees of the United States," by George B. Sudworth.

In considering the pulping and other data given for the various woods, attention is drawn to the following points:

1. The weights of wood given are for bone-dry material per solid cubic foot. This is obtained by multiplying the specific gravity of the over-dried wood based on the green volume by 62.3 lbs. (the weight of a cubic foot of water).

2. The fiber lengths as given are the average of all the available data taken from the Forest Service investigations and from other sources. Many of the measurements given are the results of averages of thousands of determinations; in other cases from only a few determinations.

3. The yield figures represent the yield of bone-dry screened and unbleached pulp per hundred cubic feet of solid bone-dry wood. It is our opinion that in general the ordinary cord of 128 cubic feet of rossed wood piled 4x4x8 feet closely approximates 100 solid cubic feet of wood. To convert the yields on bone-dry basis to air-dry pulp containing 10 per cent moisture, divide the yield by 0.9.

The yield data are based on results obtained from experimental runs made under very favorable conditions. The pulp logs on arrival at the laboratory are barked, sawed into convenient size and any wood containing knots and decayed spots is rejected. The chips are carefully sorted and are far more uniform in size and moisture content than can be obtained in commercial practice unless the mills operate under more favorable conditions than ordinarily exist. Further, each cook representing an individual experiment, it is possible to press, shred, sample and screen the pulp with fewer mechanical losses than is feasible in handling the pulp in commercial practice from the blow pit to the wet machine or to the finished paper.

4. The comparison of the character and uses of the various pulps that may be obtained from the dif-

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[1] Much of the data used in this report has been collected at a previous date by Henry E. Surface of our laboratory, but not for publication. We also wish to acknowledge the contributions of Edwin Sutermeister, R. C. Cooper, G. C. McNaughton, C. K. Textor and S. E. Lunack, who, while in the employ of the Forest Service, made some of these cooks.

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ferent woods offers certain difficulties. It has, therefore, been decided to consider white spruce as the standard wood for pulping by the sulphite, sulphate and mechanical processes and to compare the pulp that might be obtained from any given wood by this process of pulping with the pulp obtained from white spruce. Aspen wood has likewise been adopted as the standard for reduction by the soda process, and soda pulps from other woods will be compared with it.

No figures have been given on the bleaching of the sulphate pulps as we do not know of any mills making bleached sulphate pulp in this country at the present time. By this we do not mean to imply that sulphate pulp cannot be economically bleached, but this is not the present mill practice.

Further, no data are given on the possible soda pulping of the various firs, pines, hemlocks, larch, tamarack and other woods that can be reduced by the sulphate process. The laboratory has made extensive pulping trials on the reduction of these woods by the soda process and it is, of course, recognized that this process can be and is at present employed to a limited extent for reduction of certain of these woods. In general, the soda process can be used for reduction of any wood suitable for the production of sulphate pulp, where the stock is not to be bleached and where strength is of primary consideration. These soda pulps from coniferous woods could, of course, through a severe pulping treatment, be bleached with a reasonable bleach consumption.

No figures have been given for bleach consumption. It has appeared advisable to compare the ease of bleaching for any given pulp with the standard white spruce sulphite and aspen soda pulp.

The data given must, of course, be interpreted with the understanding that the figures and results are based on experimental pulping trials. We believe that it may be of interest if used with this reservation for comparing the character and yields of pulps that may be expected from different woods.

BLACK SPRUCE—Picea mariana. Wt. 23 lb. Fiber 2.6 m. m.

*Range*—Newfoundland to Hudson Bay and northwestward to the Mackenzie river; southward in Michigan, Wisconsin, Minnesota, and in the eastern mountains to North Carolina and Tennessee.

*Common Names*—Black Spruce (N. H., Vt., Mass., R. I., N. Y., Pa., W. Va., N. C., S. C., Wis., Mich., Minn., Ont. Eng.); Double Spruce (Me., Vt., Minn.); Blue Spruce (Wis.); Spruce (Vt.); White Spruce (W. Va.); Yew Pine (W. Va.); Juniper (N. C.); Spruce Pine (W. Va., Pa.); He Balsam (Del., N. C.); Epinette Jaune (Quebec); Water Spruce (Canada, Me.).

*Sulphite Pulp*
Yield 1,050 lb. Easily bleached.
Easily pulped—excellent strength and color.
*Possible Uses*—Same as white spruce.

*Sulphate Pulp*
Yield 1,150 lb.
*Character and Uses*—Similar to white spruce.

BLUE SPRUCE—Picea parryana. Wt. 23 lb. Fiber 2.8 m. m.

*Range*—Central Rocky Mountain region—Colorado, Utah and Wyoming.

*Common Names*—Parry's Spruce (Utah); Blue Spruce (Colo.); Spruce Balsam (Colo., Utah); White Spruce (Colo., Utah); Silver Spruce (Colo.); Colorado Blue Spruce (Colo.); Prickly Spruce (lit.).

*Sulphite Pulp*
Yield 1,050 lb. Easily bleached.
Easily pulped—excellent strength and color.
*Possible Uses*—Same as white spruce.

*Sulphate Pulp*
Yield 1,150 lb.
*Character and Uses*—Similar to white spruce.

ENGELMANN SPRUCE—Picea engelmanni. Wt. 21 lb. Fiber 3 m. m.

*Range*—Northern Arizona and through the Rocky Mountain region to British Columbia.

*Common Names*—Engelmann's Spruce (Utah); Balsam (Utah); White Spruce (Oreg., Colo., Utah, Idaho); White Pine (Idaho); Mountain Spruce (Mont.); Arizona Spruce (Cal. lit.).

*Sulphite Pulp*
Yield 990 lb. Easily bleached.
A little hard to pulp—excellent strength. Excellent color.
*Possible Uses*—Same as white spruce.

*Sulphate Pulp*
Yield 1,000 lb.
*Character and Possible Uses*—Similar to white spruce.

*Mechanical Pulp*
Yield 2,100 lb.
Character—Strong fiber of good color.
*Possible Uses*—Same as white spruce.

RED SPRUCE—Picea rubens. Wt. 24 lb. Fiber 3.7 m. m.

*Range*—Nova Scotia to North Carolina and Tennessee. Range imperfectly known.

*Common Names*—Red Spruce; Yellow Spruce (N. Y.); North American Red Spruce (foreign lit.).

*Sulphite Pulp*
Yield 1,080 lb. Easily bleached.
Easily pulped—good strength—excellent color.
*Possible Uses*—Same as white spruce.

*Sulphate Pulp*
Yield 1,150 lb.
Character—High-grade strong fiber.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 2,400 lb.
Character—Excellent color and strength.
*Possible Uses*—Similar to white spruce.

SITKA SPRUCE—Picea sitchensis. Wt. 24 lb. Fiber 3.5 m. m.

*Range*—Coast region (extending inland about fifty miles) from Alaska to northern California (Mendocino County).

*Common Names*—Tideland Spruce (Cal., Ore., Wash.); *Menzies' Spruce; Western Spruce; Great Tideland Spruce* (Cal. lit.).

*Sulphite Pulp*
Yield 1,080 lb. Easily bleached.
Easily pulped—excellent strength and color.
*Possible Uses*—Same as white spruce.

*Sulphate Pulp*
Yield 1,150 lb.
*Character and Uses*—Similar to white spruce.

*Mechanical Pulp*
Yield 2,040 lb.
Character—Slightly grayish color.
*Possible Uses*—Similar to white spruce.

WHITE SPRUCE—Picea canadensis. Wt. 24 lb. Fiber 2.8 m. m.

*Range*—Newfoundland to Hudson Bay and northwestward to Alaska; southward to Northern New York, Michigan, Wisconsin, Minnesota, South Dakota, Montana, and British Columbia.

*Common Names*—White Spruce (Vt., N. H., Mass., N. Y., Wis., Mich., Minn., Ont.); Single Spruce (Me., Vt., Minn.); Bog Spruce (New Eng.); Skunk Spruce (Wis., Me., New Eng., Ont.); Cat Spruce (Me., New Eng.); Spruce (Vt.); Pine (Hudson Bay); Double Spruce (Vt.).

*Sulphite Pulp*
Yield 1,030 lb. Easily bleached.
Easily pulped—excellent strength—excellent color.
*Possible Uses*—White spruce is considered the standard sulphite pulpwood and is used for news, wrapping, book, high-grade printings, etc.

*Sulphate Pulp*
Yield 1,150 lb.
Character—Very strong fine fiber.
*Possible Uses*—Highest grade of kraft paper and strong fiber board.

*Mechanical Pulp*
Yield 2,400 lb.
Character—Excellent color and strength.
*Possible Uses*—For practically every purpose where groundwood pulp is required.

ALPINE FIR—Abies lasiocarpa. Wt. 21 lb. Fiber ——.

*Range*—Rocky Mountain region from Colorado to Montana and Idaho, and westward through northern Oregon and northward to Alaska (latitude 60 degrees).

*Common Names*—Sub-Alpine Fir (Utah); Balsam (Colo., Utah, Idaho, Oreg.); White Fir (Idaho, Mont.); White Balsam; Oregon Balsam-tree (Cal.); Pumpkin-tree Alpine Fir; Mountain Balsam (mountains of Utah and Idaho); Down-

cone Fir (lit.); Downy-cone Sub-Alpine Fir (Cal. lit.).

*Sulphite Pulp*
Yield 1,010 lb. Easily bleached.
Easily pulped—good strength—excellent color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,050 lb.
Character and long fiber. Excellent strength.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 2,070 lb.
Character—White fiber, fair strength.
*Possible Uses*—Same as white spruce.

AMABALIS FIR—Abies amabalis. Wt. 22 lb. Fiber ——.
*Range*—From British Columbia (Fraser river and southward in the Cascade mountains) to Washington and Oregon.
*Common Names*—Red Fir; Red Silver Fir (Western Mountains); Fir (Cal.); Lorely Fir (Cal. lit.); Lorely Red Fir (Cal. lit.); Amabilis or Lovely Fir (Cal. lit.); "Larch" (Oreg. Lumbermen).

*Sulphite Pulp*
Yield 1,060 lb. Easily bleached.
Easily pulped—fair strength—excellent color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,100 lb.
Character—Long fiber, excellent strength.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 1,870 lb.
Character—Long fiber of excellent strength; color slightly grayish .
*Possible Uses*—Same as white spruce.

BALSAM FIR—Abies balsamea. Wt. 21 lb. Fiber 2.7 m.m.
*Range*—From Newfoundland and Labrador to Hudson Bay and northwestward to Great Bear Lake region, and south to Pennsylvania (and along high mountains to Virginia), Michigan and Minnesota.
*Common Names*—Balsam Fir (N. H., Vt., Mass., R. I., N. Y., Pa., W. Va., Wis., Mich., Minn., Nebr., Ohio, Ont.; Eng. cult.); Balsam (Vt., N. H., N. Y.); Canada Balsam (N. C.); Balm of Gilead (Del.); Balm of Gilead Fir (N. Y., Pa.); Blister Pine (W. Va.); Fir Pine (W. Va.); Firtree (Vt.); Single Spruce (N. Bruns. to Hudson Bay); Silver Pine (Hudson Bay); Sapin (Quebec); Cho-koh-tung="Blisters" (N. Y. Indians).

*Sulphite Pulp*
Yield 970 lb. Easily bleached.
Easily pulped—good strength—excellent color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,010 lb.
Character—High grade kraft fiber.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 1,910 lb.
Character—Good fiber length, strong and good color.
*Possible Uses*—Same as white spruce.

GRAND FIR—Abies Grandis. Wt. 23 lb. Fiber 3.2 m.m.
*Range*—Coast region from Vancouver Island to California (Mendocino County), and from Washington and Oregon to Northern Idaho and Montana.
*Common Names*—White Fir (Cal., Oreg., Idaho); Silver Fir (Mont., Idaho); Yellow Fir (Mont., Idaho); Oregon White Fir (Cal.); Western White Fir; Grand or Oregon White Fir (Cal. lit.); Great California Fir (lit.).

*Sulphite Pulp*
Yield 980 lb. Easily bleached.
Easily pulped—fair strength—excellent color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,140 lb.
Character—Good strong grade of kraft pulp.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 1,950 lb.
Character—Good fiber, color and strength.
*Possible Uses*—Same as white spruce.

NOBLE FIR—Abies nobilis. Wt. 22 lb. Fiber ——.
*Range*—Washington (coast mountains in southwestern part of state; Olympic Mountains on Solduc river; from Mount Baker southward in the Cascade Mountains) to Oregon (Browder Ridge on headwaters of McKinzie river in Lane County). Range at present but little known.
*Common Names*—Red Fir (Oreg.); "Larch" (Oreg. lumbermen); Noble Fir (Oreg.); Big tree; Feather Red Fir (Cal. lit.); Noble or Brocted Red Fir (Cal. lit.); Tuck Tuck (Pacific Indians).

*Sulphite Pulp*
Yield 1,010 lb. Easily bleached.
Easily pulped—poor strength—excellent color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,080 lb.
Character—Good quality of strong pulp.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 1,920 lb.
Character—Very long strong fiber—good color.
*Possible Uses*—Same as white spruce.

RED FIR—Abies magnifica. Wt. 23 lb. Fiber ——.
*Range*—Southern Oregon (Cascade Mts.) and California (Mount Shasta and along the western slopes of Sierra Nevada Mountains).
*Common Names*—Red Fir (Cal.); California Red-bark Fir (Cal.); Magnificent Fir (Cal. lit.); California Red Fir (Cal. lit.); Golden Fir (Cal. lit.).

*Sulphite Pulp*
Yield 1,080 lb. A little hard to bleach.
Easily pulped—good strength—fair color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,150 lb.
Character—Good strong fiber.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 1,915 lb.
Character—Pinkish color—fair strength.
*Possible Uses*—As a substitute for white spruce.

WHITE FIR—Abies concolor. Wt. 22 lb. Fiber 3.5 m.m.
*Range*—Oregon (Siskiyou Mountains) to Southern California (San Bernardino County); Northern Arizona and New Mexico to Colorado and Utah (Wasatch Mountains).
*Common Names*—White Fir (Cal., Idaho, Utah, Colo.); Balsam Fir (Cal., Idaho, Colo.); Silver Fir (Cal.); Balsam (Cal.); White Balsam (Utah); Bastard Pine (Utah); Balsam-tree (Idaho); Black Gum (Utah); California White Fir (Cal.); Colorado White Fir (Cal. lit.); Concolor Silver Fir (Eng. lit.).

*Sulphite Pulp*
Yield 950 lb. Easily bleached.
Easily pulped—good strength—good color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,100 lb.
Character—Good strong grade of kraft pulp.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*
Yield 2,010 lb. Satisfactory color—fair strength—good fiber.
*Possible Uses*—As a substitute for white spruce.

DOUGLAS FIR—Pseudotsuga taxifolia.
Washington and Oregon. Wt. 28 lb. Fiber and 4.4 m.m.
Montana and Wyoming—Wt. 25 lb. Fiber ——.
*Range*—From the Rocky Mountain region (in United States) and northward to central British Columbia; Pacific Coast.
*Common Names*—Red Fir (Oreg., Wash., Idaho, Utah, Mont., Colo.); Douglas Spruce (Cal., Colo., Mont.); Douglas Fir (Utah, Oreg., Colo.); Yellow Fir (Oreg., Mont., Idaho, Wash.); Spruce (Mont.); Fir (Mont.); Oregon Pine (Cal., Wash., Oreg.); Red Pine (Utah, Idaho, Colo.); Puget Sound Pine (Wash.); Douglas-tree; Cork-barked Douglas Spruce.

*Sulphite Pulp*
Yield 850 lb. Difficult to bleach. Hard to pulp. Fair strength—poor color.
*Possible Uses*—Few.

*Sulphate Pulp*
Yield 1,170 lb.
Character—Good grade of kraft pulp but not as strong as white spruce.
*Possible Uses*—Similar to white spruce.

HEMLOCK—Tsuga canadensis. Wt. 24 lb. Fiber 3.0 m.m.
*Range*—Nova Scotia to Minnesota (Carleton County), Wisconsin, Michigan, and southward in the Atlantic region along the mountains to Northern Alabama (Winston County) and Georgia.
*Common Names*—Hemlock (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., N. C., S. C., Ky., Wis., Mich., Minn., Ohio, Ont.); Hemlock Spruce (Vt., R. I., N. Y., Pa., N. J., W. Va., N. C., S. C., England, cult.); Spruce (Pa., W. Va.); Spruce Pine (Pa., Del., Va., N. C., Ga.); Oh-neh-tah ="Greens on the stick" (N. Y. Indians); Canadian Hemlock (lit.); New England Hemlock (lit.).

*Sulphite Pulp*
Yield 1,080 lb. A little hard to bleach.
Not easily pulped. Good strength—fair color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*
Yield 1,150 lb.
Character—Good strong pulp.
*Possible Uses*—Similar to white spruce.
*Mechanical Pulp*
Yield 2,030 lb.
Character—Pinkish color—short fiber.
*Possible Uses*—As a substitute for white spruce.

WESTERN HEMLOCK—Tsuga heterophylla. Wt. 23 lb. Fiber 2.7 m.m.
*Range*—Alaska to Idaho and Montana and southward (in the Cascade and coast ranges) to California (Marin County).
*Common Names*—Hemlock Spruce (Cal.); Western Hemlock (Cal.); Hemlock (Oreg., Idaho, Wash.); Western Hemlock Spruce (lit.); California Hemlock Spruce; Western Hemlock Fir (Eng.); Prince Albert's Fir (Eng.); Alaska Pine (Northwestern lumbermen).
*Sulphite Pulp*
Yield 1,050 lb. Easily bleached.
Easily pulped—good strength—fair color.
*Possible Uses*—Same as white spruce.
*Sulphate Pulp*
Yield 1,100 lb.
Character—Good strong fiber.
*Possible Uses*—Similar to white spruce.
*Mechanical Pulp*
Yield 2,160 lb.
Character—Good strength and fiber—grayish color.
*Possible Uses*—Similar to white spruce.

TAMARACK—Larix laricina. Wt. 31 lb. Fiber 2.6 m.m.
*Range*—From New Foundland and Labrador to Northern Pennsylvania, Northern Indiana, Illinois, Central Minnesota, and northwestward to Hudson Bay (Cape Churchill, Great Bear Lake, and Mackenzie River) (in Arctic Circle).
*Common Names*—Larch (Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Wis., Minn., Ohio, Ont.); Tamarack (Me., N. H., Vt., Mass., R. I., N. Y., N. J., Pa., Ind., Ill., Wis., Mich., Minn., Ohio, Ont.); Hackmatack (Me., N. H., Mass., R. I., Del., Ill., Minn., Ont.); American Larch (Vt., Wis., nurserymen); Juniper (Me., N. Bruns. to Hudson Bay); Black Larch (Minn.); Epinette Rouge (Quebec); Ka-neh-tens="The leaves fall" (Indians, N. Y.); Red Larch (Mich.); Hacmack (lit.).
*Sulphite Pulp*
Yield 1,270 lb. Difficult to bleach.
Difficult to pulp—good strength—poor color.
*Possible Uses*—Low grade wrappings.
*Sulphate Pulp*
Yield 1,400 lb.
Character—Strong, tough pulp.
*Possible Uses*—Similar to white spruce.
*Mechanical Pulp*
Yield 2,620 lb.
Character—Short fibered and gray color.
*Possible Uses*—As a substitute for white spruce.

WESTERN LARCH—Larix occidentalis. Wt. 28 lb. Fiber 2.6 m.m.
*Range*—Southern British Columbia (south of latitude 53 degrees) and south in the Cascade Mountains to the Columbia River and to Western Montana; also in Blue Mountains of Washington and Oregon.
*Common Names*—Tamarack (Oreg.); Hackmatack; Larch (Idaho, Wash., etc.); Red American Larch; Western Hamarack; Western Larch (Eng.); Great Western Larch (Cal. lit.).
*Sulphite Pulp*
Yield 1,200 lb. Difficult to bleach. Difficult to pulp—poor strength and color.
*Possible Uses*—Low grade wrappings.
*Sulphate Pulp*
Yield 1,290 lb.
Character—Good quality of kraft fiber.
*Possible Uses*—Same as white spruce.
*Mechanical Pulp*
Yield 2,100 lb.
Character—Brown color, short fiber and fair strength.
*Possible Uses*—Where a medium quality of ground-wood will answer the purpose.

JACK PINE—Pinus divaricata. Wt. 24 lb. Fiber 2.5 m.m.
*Range*—New Brunswick to New Hampshire and west through Great Lake and Hudson Bay (southern shores) region to Great Bear Lake, Mackenzie river, and Rocky Mountains; south into Northern Maine, Northern New York, Northern Indiana and Illinois, and Central Minnesota.
*Common Names*—Scrub Pine (Me., Vt., N. Y., Wis., Mich., Minn., Ont.); Gray Pine (Vt., Minn., Ont.); Jack Pine (Mich., Minn., Canada); Prince Pine (Ont.); Black Jack Pine (Wis.); Black Pine (Minn.); Cypress (Quebec to Hudson Bay); Canada Horn-cone Pine (Cal. lit.); Chek Pine; Sir Joseph Bank's Pine (Eng.); "Juniper" (Canada); Banksian Pine (lit.).
*Sulphite Pulp*
Yield 1,080 lb. Very difficult to bleach.
Not easily pulped—fair strength—poor color.
Pulp shivey and full of pitch.
*Possible Uses*—Mechanical difficulties when running this pulp over the paper machine prevent its use.
*Sulphate Pulp*
Yield 1,150 lb.
Character—Very strong, tough fiber.
*Possible Uses*—Similar to white spruce.
*Mechanical Pulp*
Yield 2,130 lb.
Character—Gray, somewhat soft, good strength, pitchy, poor finish.
*Possible Uses*—Medium grades of ground wood.

LOBLOLLY PINE—Pinus taeda. Wt. 30 lb. Fiber 3.0 m.m.
*Range*—South Atlantic and Gulf States from New Jersey (Cape May), Southern Delaware and West Virginia (Wood, Mineral, Hampshire, and Hardy counties) to Central Florida (Cape Malabar and Tampa Bay) and west to Eastern Texas (Colorado River; in Bastrop County); northward into Southeastern Indian Territory, Arkansas, and southern border of middle and West Tennessee.
*Common Names*—Loblolly Pine (Del., Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark.); Oldfied Pine (Del., Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark.); Torch Pine (Frig. lit.); Rosemary Pine (Va., N. C., in part); Slash Pine (Va., N. C., in part); Longschat Pine (Del.); Longshucks (Md., Va.); Black Slash Pine (S. C.); Frankincense Pine (lit.); Short-leaf Pine (Va., N. C., S. C., La.); Bull Pine (Texas and Gulf region); Virginia Pine; Sap Pine (Va., N. C.); Meadow Pine (Fla.); Cornstalk Pine (Va.); Black Pine (Va.); Foxtail Pine (Va., Md.); Indian Pine (Va., N. C.); Spruce Pine (Va., in part); Bastard Pine (Va., N. C.); Yellow Pine North Ala., N. C.); Swamp Pine (Va., N. C.); Longstraw Pine (Va., N. C., in part).
*Sulphite Pulp*
Yield 1,140 lb. Difficult to bleach.
Easily pulped—good strength and color.
*Possible Uses*—As a substitute for white spruce.
*Sulphate Pulp*
Yield 1,420 lb.
Character—Strong but coarse fiber.
*Possible Uses*—Similar to white spruce.
*Mechanical Pulp*
Yield 2,450 lb.
Character—Short fiber and very pitchy.
*Possible Uses*—Only when mixed with better grades of ground-wood fibers.

LODGEPOLE PINE—Pinus murrayana. Wt. 24 lb. Fiber 2.3 m.m.
*Range*—From Alaska (Yukon river) and southward through interior British Columbia; the mountains of Washington and Oregon to California (Sierra Nevada Mountains to San Jacinto Mountains); plateau east of the Rocky Mountains (latitude 56) and south through the Rocky Mountain region to New Mexico and Northern Arizona. Also Coast region from Alaska to California (Mendocino County).
*Common Names*—Tamarack (Wyo., Utah, Mont., Cal.); Prickly Pine (Utah); White Pine (Mont.); Black Pine (Wyo.); Lodgepole Pine (Wyo., Mont., Idaho); Spruce Pine (Colo., Idaho, Mont.); Tamarack Pine (Cal.); Murray Pine (Cal. lit.); Scrub Pine; Knotty Pine, Sand Pine (Oreg.); Bolander's Pine; Henderson's Pine; North Coast Scrub Pine (Cal. lit.).
*Sulphite Pulp*
Yield 1,080 lb. A little hard to bleach.
Easily pulped. Excellent strength and color.
*Possible Uses*—As a substitute for white spruce.
*Sulphate Pulp*
Yield 1,120 lb.
*Character and Uses*—Same as white spruce.
*Mechanical Pulp*
Yield 2,140 lb.
*Character and Uses*—A little pitchy but otherwise similar to white spruce.
*Note*—The lodgepole pine which grows in the lowlands in the coastal region is very similar to jack pine. The Rocky Mountain region lodgepole pine, however, contains much less pitch and is to be preferred for sulphite and mechanical pulps.

LONGLEAF PINE—Pinus palustris. Wt. 34 lb. Fiber 3.7 m.m.
*Range*—Coast region, from Southern Virginia (Norfolk) to Florida (Tampa Bay and Cape Canaveral) to Eastern Texas (Trinity River); northward in Alabama to the northeastern part of the State (Clay and Walker counties) and Northwestern (border counties) Georgia.
*Common Names*—Longleaved Pine (Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex.); Southern Pine (N. C., Ala., Miss., La.); Yellow Pine (Del., N. C., S. C., Ala., Fla., La., Tex.); Turpentine Pine (N. C.); Rosemary Pine (N. C.); Brown Pine

(Tenn.); Hard Pine (Ala., Miss., La.); Georgia Pine (general, Del.); Fat Pine (Southern States); Southern Yellow Pine (general); Southern Hard Pine (general); Southern Heart Pine (general); Southern Pitch Pine (general); Heart Pine (N. C. and South Atlantic region); Pitch Pine (Atlantic region); Longleaved Yellow Pine (Atlantic region); Longleaved Pitch Pine (Atlantic region); Longstraw Pine (Atlantic region); North Carolina Pitch Pine (Va., N. C.); Georgia Yellow Pine (Atlantic region); Georgia Heart Pine (general); Georgia Longleaved Pine (Atlantic region); Georgia Pitch Pine (Atlantic region); Florida Yellow Pine (Atlantic region); Florida Pine (Atlantic region); Florida Longleaved Pine (Atlantic region); Texas Yellow Pine (Atlantic region); Texas Longleaved Pine (Atlantic region).

*Sulphite Pulp*

Yield 1,840 lb. (crude pulp). Cannot be bleached.
Very poor color. In general, this wood cannot be considered satisfactory for sulphite pulp.
*Possible Uses*—Few.

*Sulphate Pulp*

Yield 1,600 lb.
Character—Strong but coarse fiber.
*Possible Uses*—Similar to white spruce.

NORWAY PINE—Pinus resinosa. Wt. 27 lb. Fiber 3.7 m.m.

*Range*—From Newfoundland and along the northern shores of St. Lawrence Gulf to Northern Ontario (north of Abitibi Lake) to Southern Manitoba (near southern end of Lake Winnipeg); southward through the Northern States to Massachusetts (Middlesex County), Pennsylvania (Chester County), Northeastern Ohio (north of Cleveland), Central Michigan (Saginaw), Northern Wisconsin (Oshkosh and Eau Claire), and Northeastern Minnesota.
*Common Names*—Red Pine (Vt., N. H., N. Y., Wis., Minn., Ont.); Norway Pine (Me., N. H., Vt., Mass., N. Y., Wis., Mich., Minn., Ont.); Hard Pine (Wis.); Canadian Red Pine (Eng.).

*Sulphate Pulp*

Yield 1,350 lb.
*Character and Possible Uses*—Similar to white spruce.

PITCH PINE—Pinus rigida. Wt. 29 lb. Fiber ——.

*Range*—From Southern New Brunswick (St. Johns river) to Eastern Ontario (north shore of Lake Ontario and lower Ottawa River) and southward in the Atlantic region to Southern Virginia (Norfolk) and along the mountains to Northern Georgia (Atlanta); west to Western New York (Ithaca), Northeastern Pennsylvania, Eastern Ohio (border counties south of Canton) and Kentucky, Eastern Tennessee (to Cumberland Mountains).
*Common Names*—Pitch Pine (Vt., N. H., Mass., R. I., Conn., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Ga., Ohio, Ont., Md., Eng.); Longleaved Pine (Del.); Longschat Pine (Del.); Black Norway Pine (N. Y.); Hard Pine (Mass.); Yellow Pine (Pa.); Black Pine (N. C.); Rigid Pine (Eng. lit.); Sap Pine (lit.).

*Sulphate Pulp*

Yield 1,430 lb.
*Character and Uses*—Similar to white spruce.

SAND PINE—Pinus clausa. Wt. 29 lb. Fiber ——.

*Range*—Coast of Alabama (Baldwin County) and Western Florida (to Pease Creek); east coast of Florida from St. Augustine to Halifax River.
*Common Names*—Sand Pine (Fla., Ala.); Oldfield Pine (Fla.); Florida Spruce Pine (Ala.); Scrub Pine (Fla.); Spruce Pine (Fla.); Upland Spruce Pine (Fla.).

*Sulphite Pulp*

Yield 1,300 lb. Difficult to bleach, and shivey.
Easily pulped—fair strength—good color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*

Yield 1,220 lb.
*Character and Uses*—Similar to white spruce.

SCRUB PINE—Pinus virginiana. Wt. 26 lb. Fiber 2.8 m.m.

*Range*—From New York (Staten Island) to South Carolina (Aiken River) and Northern Alabama (Winston, Cullman, and Dekalb counties); west into Southern Indiana, to middle Tenessee (Putnam County).
*Common Names*—Jersey Pine (N. J., Pa., Del., N. C., S. C.); Scrub Pine (R. I., N. Y., Pa., Del., N. C., S. C., Ohio); Short Shucks (Md., Va.); Shortshat Pine (Del.); Spruce Pine (N. J., N. C.); Shortleaved (N. C.); Cedar Pine (N. C.); River Pine (N. C.); Nigger Pine (Tenn.); New Jersey Pine (lit.).

*Sulphite Pulp*

Yield 1,000 lb.
Difficult to bleach, easily pulped and good color.
*Possible Uses*—As a substitute for white spruce.

*Sulphate Pulp*

Yield 1,250 lb.
Character—Strong but coarse fiber.
*Possible Uses*—Similar to white spruce.

SUGAR PINE—Pinus lambertiana. Wt. 23 lb. Fiber 4.1 m.m.

*Range*—Coast region from Oregon (head of Mackenzie and Rogue rivers) to California (Sierra Nevada Mountains and coast ranges to Santa Lucia Mountains; San Bernardino and Cuyamaca Mountains).
*Common Names*—Sugar Pine (Cal., Oreg.); Big Pine; Shade Pine (Cal.); Great Sugar Pine; Little Sugar Pine; Gigantic Pine (Cal. lit.); Purple-coned Sugar Pine.

*Sulphite Pulp*

Yield 1,010 lb. A little difficult to bleach.
Easily pulped. Poor strength—fair color.
*Possible Uses*—Dark colored wrappings.

*Sulphate Pulp*

Yield 1,150 lb.
*Character and Uses*—Similar to white spruce.

WESTERN YELLOW PINE—Pinus ponderosa. Wt. 24 lb. Fiber. 3.6 m.m.

*Range*—From British Columbia (interior south of latitude 51°), and Dakota (Black Hills region), southward in the Pacific and Rocky Mountain region to Western Texas and Mexico.
*Common Names*—Yellow Pine (Cal., Colo., Mont., Idaho, Utah, Wash., Oreg.); Bull Pine (Cal., Wash., Utah, Idaho, Oreg.); Big Pine (Mont.); Longleaved Pine (Utah, Nev.); Red Pine; Pitch Pine; Southern Yellow Pine; Heavy-wooded Pine (Eng.); Western Pitch Pine; Heavy Pine (Cal.); Foothills Yellow Pine; Sierra Brownbark Pine; Montana Black Pine (Cal. lit.); "Gambier Parry's Pine" (Eng. lit.).

*Sulphite Pulp*

Yield 1,130 lb. Difficult to bleach, shivey.
Not difficult to pulp. Very poor strength and color.
*Possible Uses*—Few.

*Sulphate Pulp*

Yield 1,100 lb.
Character—Fine, high grade, very strong, and tough fiber.
*Possible Uses*—Same as white spruce.

*Mechanical Pulp*

Yield 2,060 lb.
Character—Fibers are long, coarse and soft, creamy color and somewhat pitchy.
*Possible Uses*—Where a medium quality of ground wood will answer the purpose.

WHITE PINE—Pinus strobus. Wt. 22 lb. Fiber 3.8 m.m.

*Range*—From Newfoundland (White Bay region) and along the northern shores of St. Lawrence Gulf to Northern Ontario (near Abitibi and Nipigon lakes), Southern Manitoba (near southern end of Lake Winnipeg); southward through Northern and Eastern Minnesota, northeastern (Mitchell county) and eastern border of Iowa (to Scott County), Northern (counties) Illinois, southern shores of Lake Michigan, Southern Michigan (north of Allegan, Eaton, and St. Clair counties), Northeastern and Eastern (border counties) Ohio, and along the Allegheny Mountains to Northern Georgia, Tallulah Falls).
*Common Names*—White Pine (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., Ga., Ind., Ill., Wis., Mich., Minn., Ohio, Ont., Nebr.); Weymouth Pine (Mass., S. C.); Soft Pine (Pa.); Northern Pine (S. C.); Spruce Pine (Tenn.).

*Sulphite Pulp*

Yield 1,210 lb. Difficult to bleach.
Difficult to pulp. Fair strength, but shivey and poor color.
*Possible Uses*—Few.

*Sulphate Pulp*

Yield 1,100 lb.
Character—Excellent strength and color.
*Possible Uses*—Similar to white spruce.

*Mechanical Pulp*

Character—Good strength and color, but pitchy.
*Possible Uses*—Similar to white spruce.

INCENSE CEDAR—Libocedrus decurrens. Wt. 23 lb. Fiber 2 m.m.

*Range*—From Oregon (North Fork of Sanitam River and southward on the Western slopes of the Cascade Mountains through California (Western slopes of Sierra Nevada Mountains and coast ranges from southern border of Mendocino County to San Bernardino, San Jacinto, and Cuyamaca Mountains); Western Nevada; Lower California (Mount San Pedro Martir).
*Common Names*—White Cedar (Cal., Oreg.); Cedar (Cal., Oreg.); Incense Cedar (Cal., Oreg.); Post Cedar (Cal., Nev.); Juniper (Nev.); Bastard Cedar (Cal., Wash.); Red Cedar; California Post Cedar (Cal. lit.).

*Sulphite Pulp*

Yield 830 lb. Difficult to bleach.
Good strength—poor color.
*Possible Uses*—Few.

*Sulphate Pulp*

Yield 950 lb.
Character—Dark colored, strong and hard fiber.

*Possible Uses*—As a substitute for white spruce.

BALD CYPRESS—Taxodium distichum. Wt. 27 lb. Fiber 3.3 m.m.
*Range*—From Southern Delaware (Sussex County and southward in the coast region) to Florida (Mosquito Inlet and Cape Romano); westward in the Gulf coast region to Texas (Devils del' River); and northward through Louisiana, Arkansas, and Eastern Mississippi and Tennessee, Southeastern Missouri, Western and Northwestern Kentucky, Southern Illinois, and Southwestern Indiana (Knox County).
*Common Names*—Bald Cypress (Del., N. C., S. C., Ala., La., Fla., Tex., Ark., Mo., Ill., Ind.); White Cypress (N. C., S. C., Fla., Miss.); Black Cypress (N. C., S. C., Ala., Tex.); Red Cypress (Ga., Miss., La., Tex.); Swamp Cypress (La.); Cypress (Del., N. C., S. C., Fla., Miss., Ky., Mo., Ill.); Deciduous Cypress (Del., Ill., Tex.); Southern Cypress (Ala.).
*Sulphite Pulp*
Yield 1,160 lb. Very difficult to bleach.
Difficult to cook—poor strength and color.
*Possible Uses*—Few.
*Sulphate Pulp*
Yield 1,350 lb.
Character—Fiber long but tender.
*Possible Uses*—As a substitute for white spruce.

REDWOOD—Sequoia sempervirens. Wt. 23 lb. Fiber 5.5 m.m.
*Range*—From the southern borders of Oregon (on Chetco River (about six miles from mouth, and on Winchuck River), and southward in the coast region (twenty to thirty miles inland) through California (to Salmon Creek Canyon, twelve miles south of Punta Gorda, Monterey County).
*Common Names*—Sequoia (Cal.); Coast Redwood (Cal.); Redwood (Cal. and Am. lit.); California Redwood (Eng. lit.).
*Sulphite Pulp*
Yield 920 lb. Difficult to bleach.
Easily pulped—fair strength—dark colored.
*Possible Uses*—Low Grade wrappings.
*Sulphate Pulp*
Yield 950 lb.
Character—Long fibered but tender.
*Possible Uses*—As a substitute for white spruce.

WHITE ASH—Fraxinus americana. Wt. 34 lb. Fiber 1.2 m.m.
*Range*—From Nova Scotia and Newfoundland to Florida and westward to Ontario and North Minnesota, Eastern Nebraska, Kansas, Indian Territory, and Texas (Trinity River).
*Common Names*—White Ash (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Del., Pa., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ky., Mo., Ill., Ind., Iowa, Kansas, Nebr., Mich., Ohio, Ont., Minn., N. Dak., Wis.); Ash (Ark., Iowa, Wis., Ill., Mo., Minn.); American Ash (Iowa); Franc-Frene (Quebec); Cane Ash (Ala., Miss., La.).
*Sulphite Pulp*
Yield 1,530 lb. A little hard to bleach.
Easily pulped. Very weak. Poor color.
*Possible Uses*—Few.
*Soda Pulp*
Yield 1,350 lb.
Character—Very difficult to reduce and bleach.
*Possible Uses*—Few.

ASPEN—Populus tremuloides. Wt. 23 lb. Fiber 1 m.m.
*Range*—Southern Laborador to Hudson Bay (southern shores) and northwestward to the MacKenzie River (near mouth and Alaska (Yukon River); southward to Pennsylvania (mountains), Northeastern Missouri, Southern Nebraska, and throughout the western mountains to Northern New Mexico and Arizona and Central California; Lower California (San Pedro Matir Mountains) and Mexico (mountains to Chicuahua)
*Common Names*—Aspen (N. H., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Ill., Ind., Wis., Mich., Minn., N. Dak., Nebr., Ohio, Ont., Oreg., Utah, Idaho, Nev., Mont., Colo., Cal.); Quaking Asp (N. Y., Pa., Del., Cal., N. Mex., Idaho, Colo., Ariz., Ill., Iowa, Minn., Mont., Nebr., Utah, Oreg., Nev.); Mountain Asp (Mont.); American Aspen (Vt.); Aspen Leaf (Pa.); White Poplar (Mass.); Trembling Poplar (Minn., Col.); American Poplar (Minn., Colo.); Poplar (Vt., N. Y., Ill., Ind., Minn., Mont.); Popple (Wis., Iowa, Mont.); Tremble (Quebec); Trembling Aspen (Iowa); Aspen Poplar (Cal., Mont.).
*Sulphite Pulp*
Yield 1,030 lb. Easily bleached.
Easily pulped—very weak—excellent color.
*Possible Uses*—Used with longer fibered stock for better grade of papers.
*Soda Pulp*
Yield 1,080 lb.
Character—Soft and short fibered—easily bleached.
*Possible Uses*—When bleached and mixed with longer fibered bleached stock is well adapted for book, envelope, and high grade printings.
*Mechanical Pulp*
Yield 2,170 lb.
Character—Short fibered, poor strength, good color, but may have black specks present.
*Possible Uses*—As a filler when used with longer fibered stocks.

COTTONWOOD—Populus deltoides. Wt. 23 lb. Fiber 1.3 m.m.
*Range*—From Quebec (Lower Maurice River) and Vermont (Lake Champlain) through western New England and New York, Pennsylvania (west of Alleghenies), Maryland, and Atlantic States to Western Florida and west to the Rocky Mountains from Southern Alberta to Northern New Mexico.
*Common Names*—Cottonwood (N. H., Vt., Mass., R. I., N. Y., N. J., W. Va., N. C., Ala., Fla., Miss., La., Tex., Cal., Ky., Mo., Ill., Wis., Kans., Nebr., Iowa, Minn., Mich., Ohio, Ont., Colo., Mont., N. Dak., S. Dak.); Big Cottonwood (Miss., Neb.); Yellow Cottonwood (Ark., Iowa, Neb.); Cotton-tree (N. Y.); Carolina Poplar (Pa., Miss., La., N. Mex., Ind., Ohio); Necklace Poplar (Texas, Colo.); Vermont Poplar (Vt.); Whitewood (Iowa); Broad-leaved Cottonwood (Colo.).
*Sulphite Pulp*
Yield 1,035 lb. Easily bleached.
Easily pulped—very weak. Excellent color.
*Possible Uses*—Same as aspen.
*Soda Pulp*
Yield 1,030 lb.
Character—Soft and easily bleached.
*Possible Uses*—Same as aspen.
*Mechanical Pulp*
Yield 2,180 lb.
Character—short fibered, weak, good color.
*Possible Uses*—As a filler when used with longer fibered stocks.

BASSWOOD—Tilia americana. Wt. 21 lb. Fiber 1.1 m.m.
*Range*—New Brunswick to Virginia and (along Alleghany Mountains) to Georgia and Alabama (mountains); west (in Canada) to Lake Superior (eastern shores) and to Lake Winnipeg (southern shores) and Assiniboine River (in United States), to Eastern Dakota, Eastern Nebraska, Kansas, Oklahoma, and Eastern Texas.
*Common Names*—Basswood (Me., N. H., Vt., R. I., Mass., Conn., N. Y., N. J., Del., Pa., W. Va., D. C., N. C., S. C., Ga., Ala., Miss., La., Ark., Ky., Ill, Ind., Iowa, Wis., Mich., Ohio, Ont., Neb., Kans., Minn., N. Dak.); American Linden (Me., N. H., R. I., N. Y., Pa., Del., N. C., Miss., Ohio, Ill., Neb., N. Dak., Ont., Minn.); Linn (Pa., Va., W. Va., Ala., La., Ill., Ind., Ohio, Mo., Iowa, Kans., Nebr., Wis., S. Dak.); Linden (Vt., R. I., Pa., W. Va., Nebr., Minn.); Limetree (R. I., N. C., S. C., Ala., Miss., La., Ill.); Whitewood (Vt., W. Va., Ark., Minn., Ont.); Beetree (Vt., W. Va., Wis.); Black Limetree (Tenn.); Smooth-leaved Limetree (Tenn.); White Lind (W. Va.); Wickup (Mass.); Yellow Basswood (Ind.); Lein (Ind.).
*Soda Pulp*
Yield 1,020 lb.
Character—Soft and easy bleaching.
*Possible Uses*—Similar to aspen.

PAPER BIRCH—Betula papyrifera. Wt. 34 lb. Fiber 1.2 m.m.
*Range*—From Labrador to Hudson Bay (southern shores), Great Bear Lake, Yukon River and coast of Alaska; southward to New York (Long Island) and Northern Pennsylvania, Central Michigan, and Minnesota, Northern Nebraska (Bluffs of Niobrara River), Dakota (Black Hills), Northern Montana, and Northwestern Washington (near Seattle).
*Common Names*—Paper Birch (N. H., Vt., Mass., R. I., Conn., N. Y., Wis., Mich., Minn., Ont.); Canoe Birch (Me., Vt., N. H., R. I., Mass., N. Y., Pa., Wis., Minn., Ont.); White Birch (Me., N. H., Vt., R. I., N. Y., N. J., Wis., Minn., Mich., Nebr., Ont.); Silver Birch (Minn., N. Y.); Large White Birch (Vt.); Boleau (Quebec).
*Sulphite Pulp*
Yield 1,500 lb. Difficult to bleach.
Easily pulped—poor strength and color.
*Possible Uses*—Few.
*Soda Pulp*
Yield 1,350 lb.
Character—More difficult to reduce than aspen—soft, easily bleached.
*Possible Uses*—Similar to aspen.
*Mechanical Pulp*
Yield 3,000 lb.
Character—Pinkish color—short fiber and poor strength.
*Possible Uses*—As a filler with long fibered stocks.

YELLOW BIRCH—Betula lutea. Wt. 34 lb. Fiber 1.5 m.m.
*Range*—From Newfoundland and along the northern shores of St. Lawrence Gulf to Abitibi Lake and Rainy River; southward to Northern Minnesota and through the Northern States to Eastern Tennessee, North Carolina, and Delaware.

*Common Names*—Yellow Birch (Me., N. H., Vt., Mass., Conn., R. I., N. Y., N. J., Pa., N. C., S. C., Ill., Mich., Wis., Minn., N. Dak., Ont.); Gray Birch (Vt., R. I., Pa., Mich., Minn.); Swamp Birch (Minn.); Silver Birch (N. H.); Merisier (Quebec); Merisier Rouge (Quebec).

*Sulphite Pulp*

Yield 1,590 lb. Easily bleached.
Easily pulped—very weak—good color.
*Possible Uses*—Same as aspen.

*Soda Pulp*

Yield 1,360 lb.
Character—More difficult to reduce than aspen—soft, easily bleached.
*Possible Uses*—Same as aspen.

CHESTNUT—Castanea dentata. Wt. 25 lbs. Fiber 1.0 m.m.

*Range*—From Southern Maine to Northwestern Vermont (Winooski River), Southern Ontario, and Southern shores of Lake Ontario to Southeastern Michigan; southward to Delaware and Southeastern Indiana, and on the Allegheny Mountains to Central Kentucky and Tennessee, Central Alabama, and Mississippi.

*Common Names*—Chestnut (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Del., Md., Va., W. Va., N. C., Ga., Ala., Miss., Ky., Mo., Mich., Ont.); O-heh-yah-taf="Prickly Bur" (Indians, N. Y.).

*Sulphite Pulp*

Not pulped.

*Soda Pulp*

Yield (on extracted chips) 950 lb.
Character—Soft, easy bleaching, and a little hard to cook.
*Possible Uses*—Similar to aspen. Unextracted wood can be pulped but is very difficult to reduce and bleach.

CUCUMBER-TREE—Magnolia acuminata. Wt. 27 lb. Fiber 1.3 m.m.

*Range*—From Western New York through Southern Ontario to Southern Illinois and south in the Appalachian Mountains to Southern Alabama (Stockton) and Northeastern Mississippi (Meridian); Central Kentucky and Tennessee (near Nashville and eastern part of State); Northeastern, Southern and Southwestern Arkansas.

*Common Names*—Cucumber-tree (R. I., Mass., N. Y., Pa., D. C. (cult.), N. C., S. C., Ala., Miss., La., Ark., Ky., W. Va., Ohio, Ind., Ill.); Mountain Magnola (Miss., Ky.); Cucumber (W. Va.); Black Lin (W. Va.); Magnolia (Ark.); Pointed-leaved Magnolia (lit.).

*Soda Pulp*

Yield 1,200 lb.
Character—A little harder to reduce and bleach than aspen.
*Possible Uses*—Same as aspen.

BLACK GUM—Nyssa sylvatica. Wt. 30 lb. Fiber 1.7 m.m.

*Range*—From Maine (Kennebec River) to Florida (Kissimmee River and Tampa Bay) and west to Southern Ontario, Southern Michigan (up to Gratiot County), Southeastern Missouri, and Texas (Brazos River).

*Common Names*—Black Gum (N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ill., Ind.); Sour Gum (Vt., Mass., R. I., N. Y., N. J., Pa., Del, Va., W. Va., S. C., Fla., Tex., Ohio, Ind., Ill.); Tupelo (Mass., R. I., N. J., Del., S. C., Ala., Fla., Miss., Tex., Ill., Ohio); Pepperidge (Vt., Mass., R. I., N. Y., N. J., S. C., Tenn., Mich., Ohio, Ont.); Wild Peartree (Tenn.); Yellow Gumtree (Tenn.); Gum (Md.); Stinkwood (W. Va.); Tupelo Gum (Fla.).

*Soda Pulp*

Yield 1,300 lb.
Character—Soft; a little harder to cook and bleach than aspen.
*Possible Uses*—Similar to aspen.

*Mechanical Pulp*

Yield 2,610 lb.
Character—Very short, but tough fiber, very white color.
*Possible Uses*—As a filler with longer fibered stocks.

COTTON GUM—Nyssa aquatica. Wt. 29 lb. Fiber 1.6 m.m.

*Range*—Coast region from Southern Virginia to Northern Florida, and through the Gulf States to Texas (Nueces River); northward through Arkansas, West Tennessee and Kentucky, Southern and Southeastern Missouri to Southern Illinois (lower Wabash River).

*Common Names*—Large Tupelo (Ala., La., Tex.); Tupelo Gum (Ga., Ala., Miss., La.); Sour Gum (Ark., Mo.); Swamp Tupelo (S. C., La.); Cotton Gum (N. C., S. C., Fla.); Tupelo (N. C., S. C.); Wild Olivetree (La.); Olivier à grandes feuilles (La.); Olive tree (Miss.)

*Sulphite Pulp*

Yield 1,160 lb. Easily bleached.
Easily pulped. Poor strength—fair color.
*Possible Uses*—Same as aspen.

*Soda Pulp.*

Yield 1,200 lb.
Character—Soft, but harder to bleach than aspen.
*Possible Uses*—Similar to aspen.

RED GUM—Liquidambar styraciflua. Wt. 27 lb. Fiber 1.6 m.m.

*Range*—From Connecticut (Fairfield County) to Southeastern Missouri and Arkansas; south to Florida (Cape Canaveral and Tampa Bay) and Texas (Trinity River).

*Common Names*—Sweet Gum (Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark., Ky., Mo., Ill., Ind., Ohio); Liquidamber (R. I., N. Y., Del., N. J., Pa., La., Tex., Ohio, Ill.); Red Gum (Va., Ala., Miss., Tex., La.); Gum (Va.); Gumtree (S. C., La.); Alligator-wood (N. J.); Bilsted (N. J.); Starleaved Gum; Satin Walnut (lumber markets).

*Sulphite Pulp*

Yield 1,190 lb. Difficult to bleach.
Easily pulped—very poor strength—dark colored.
*Possible Uses*—Few.

*Soda Pulp*

Yield 1,080 lb.
Character—A little more difficult to reduce than aspen. Soft and hard to bleach.
*Possible Uses*—Same as aspen.

RED OAK—Quercus rubra. Wt. 35 lb. Fiber 1.5 m.m.

*Range*—Nova Scotia and Southern New Brunswick through Quebec and along the north shores of Lake Huron to near Lake Namekagon; south to Middle Tennessee and Virginia, and along the Appalachian Mountains to Northern Georgia; west to Eastern Nebraska, Central Kansas.

*Common Names*—Red Oak (Me., Vt., N. H., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ark., Mo., Ky., Ill., Ind., Iowa, Nebr., Kans., Mich., Minn., S. Dak., Ont.); Black Oak (Vt., Conn., N. Y., Wis., Iowa, Nebr., S. Dak., Ont.); Spanish Oak (Pa., N. C.).

*Sulphite Pulp*

Yield 1,600 lb. Easily bleached.
Easily pulped. Very weak—poor color.
*Possible Uses*—Few.

*Soda Pulp*

Yield 1,400 lb.
Character—Very difficult to pulp and bleach.
*Possible Uses*—Few.

WHITE OAK—Quercus alba. Wt. 37 lb. Fiber 1.5 m.m.

*Range*—From Southern Maine to Southwestern Quebec and through Central and Southern Ontario, lower peninsula of Michigan and Southern Minnesota to Southeastern Nebraska and Eastern Kansas; south to Northern Florida and Texas Brazos river).

*Common Names*—White Oak (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J. ,Pa., Del., Va., W. Va., N. C., S. C., Ala., Fla., Ga., Miss., La., Tex., Ky., Mo., Ohio, Ill., Ind., Kans., Nebr., Mich., Wis., Minn., S. Dak. (cult.), Iowa, Ont.); Stave Oak (Ark.).

*Soda Pulp*

Yield 1,480 lb.
Character—Difficult to pulp and bleach.
*Possible Uses*—Few.

SYCAMORE—Plaxtanus occidentals. Wt. 29 lb. Fiber 1.7 m.m.

*Range*—Southeastern New Hampshire and southern Maine to northern Vermont and Lake Ontario (Don River, near north shores of the lake); west to eastern Nebraska and Kansas, and south to northern Florida, central Alabama and Mississippi, and Texas (Brazos river and thence south to Devils river).

*Common Names*—Sycamore (Vt., N. H., Mass., Conn., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ky., Ark., Mo., Ill., Ind., Iowa, Kansas, Nebr., Mich., Wis., Ohio, Ont.); Buttonwood (Vt., N. H., R. I., Mass., N. Y., N. J., Pa., Del., S. C., Ala., Miss., La., Tex., Ark., Mo., Ill., Nebr., Mich., Minn., Ohio, Ont.); Button ball-tree (Mass., R. I., Conn., N. Y., N. J., Pa., Del., Miss., La., Mo., Ill., Iowa, Mich., Nebr., Ohio); Buttonball (R. I., N. Y., Pa., Fla.); Planetree (R. I., Del., S. C., Kans., Nebr., Iowa); Water Beech (Del.); Platane (La.); Cotonier (La.); Bois puant (La.) Oo-da-te-cha-wun-nes="Big stockings" (Indians, N. Y.).

*Soda Pulp*

Yield 1,300 lb.
Character—Soft, easily bleached.
*Possible Uses*—Similar to aspen.

BLACK WILLOW—Salix nigra. Wt. 21lb. Fiber 0.8 m.m.

*Range*—New Brunswick to southern Florida and west to eastern Dakota, Nebraska, Kansas, Oklahoma, southern Arizona, and south into Mexico. In California Sacramento River to Arizona.

*Common Names*—Black Willow (N. H., Vt., R. I., N. Y., Pa., Del., S. C., Fla., Ala., Miss., La., Tex., Ariz., Cal., N. Mex., Utah, Ill., Wis., Mich., Minn., Nebr., Kan., Ohio, Ont., N.

(*Continued on page* 369)

# Weekly Inventory at Soda and Sulphite Pulp Mills

LEAKY tanks and pipe lines and slopovers from careless operation at soda and sulphate pulp mills are soon detected if a weekly inventory is taken of soda in the system. This can be accomplished closely enough for all practical purposes in the following way:

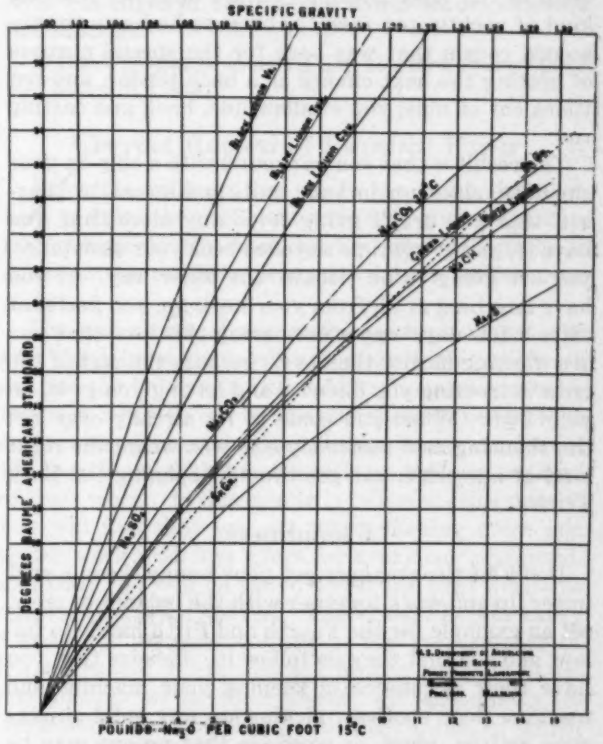
Make note of the density and height of liquor in the various storage tanks at a certain time each week, preferably during the Sunday shutdown. A table should be made for each different size of tank, by which the volume in cubic feet for any height of liquor may be read. Using the accompanying graph, determine the amount of soda, figured as $Na_2^0$, by multiplying the pounds of soda per cubic foot for the density of liquor in the tank by the volume in cubic feet. In case of an unusually long shutdown, correction for temperature should be made.

Three separate curves are given for black liquors, each of which is typical of the liquor obtained from the plup wood commonly used in the localities indicated. The black liquor from the Virginia mill was obtained from a mixture of scrub, loblolly, and shortleaf pines. The black liquor from the Texas mill was obtained from material which was about 50 per cent slabs and edgings from longleaf pine and 50 per cent cordwood from second growth shortleaf pine. Black liquor from the Canadian mill was obtained from spruce and balsam.

Each mill should determine the typical curve for its own black liquor.

The curves for green liquor and white liquor will not vary much in different mills where the usual methods of soda recovery are used. The curves for sodium carbonate and caustic soda are applicable to the liquors of soda pulp mills. The curve for sodium sulphate coincides up to the break (which is the point of saturation at 15°) with the curve for the back liquor of a Canadian mill.

Abscissae indicated at the top of the graph are to be used with the specific gravity curve in converting




degrees Beaume to specific gravity. The abscissae to be used for all the other curves are written at the bottom of the graph as pounds per cubic foot.

*Continued from page 368.*

Dak.); Swamp Willow (N. C., S. C.); Willow (N. Y., Pa., N. C., S. C., Miss., Tex., Cal., Ky., Mo., Nebr.)

*Sulphite Pulp*[1]

Yield, 1,150 lb. Easily bleached.
Easily pulped. Very weak—excellent color.
*Possible Uses*—Same as aspen.

*Soda Pulp*

Yield 950 lb.
Character—Soft and easily bleached.
*Possible Uses*—Similar to aspen.

BEECH—Fagus atropunicea. Wt. 36 lb. Fiber ——.

*Range*—Nova Scotia to Lake Huron (north shores) and northern Wisconsin; south to western Florida and west to southeastern Missouri and Texas (Trinity River).

*Common Names*—Beech (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark., Ky., Mo., Ohio, Ill., Ind., Mich., Nebr., Minn., Ont.); Red Beech (Me., Vt., Ky., Ohio); White Beech (Me., Ohio, Mich.); Ridge Beech (Ark.)

*Soda Pulp*

Yield 1,530 lb.
Character—Slightly more difficult to reduce than aspen—soft, easily bleached.
*Possible Uses*—Same as aspen.

# The Duties of a Third Hand

By PAUL A. SMITH

NOW, Mr. Third Hand, did it ever occur to you, that you would be a fine back tender if you were given the opportunity. Sure it has, for any normal he man wants to go ahead and not be a stick-in-the-mud. But, along comes some croaker, who shoots it into you that you don't stand a chance, because the Boss Machine Tender does not like the kind of necktie you wear, or because he has a thirty-second cousin that was born for the special purpose of getting the next chance as a back tender, and ten times out of nine, you swallow line, hook and casting rod.

The result is that you go around with a chip on your shoulder, slack up in your gait, and swear to yourself that you aren't going to do any more than you have to, and every time anyone needs your assistance, you are going to be "lookin' the other way." If you have anything at all from your neck up, you find that after a few days' experience along this line, that you are working harder than ever, because the rest of the crew is treating you likewise and letting you go it, on your own. When you come to its already over but the shouting, and somebody else who wears the right kind of a necktie, has got the new opening for Back Tender.

## Cleanliness

Don't let the croakers get your nanny, keep a stiff upper lip and work together with the balance of crew, set an example for the Fourth and Fifth hands to follow, and see that they do follow it. Be sure that you have their assistance in keeping your machine and machine floor spotless, picking up any solid objects such as iron, glass, or wood, so that no one may be endangered thereby, and prevent any of the finished rolls from being damaged. At the same time do all you can to learn the duties of the back tender, and you will be surprised how soon you get your advancement and how pleasant it will be for to get along in your new position, when you are prepared to fill the bill.

## The Back Tender Understudy

Make a study of where the exact stations of the fourth and fifth hands ought to be to accomplish the best results with the least amount of effort. See that they keep the calenders, reel and winder looking like new all the time, and that they assist you in keeping the doctors on the press and calender rolls clean, being sure that they use the steps provided and that their shoes, if they are wearing any, are in condition to get a firm foothold that will prevent their slipping and injuring themselves.

Whenever the Wires, Felts, or Jackets, are being renewed or repaired be sure that you are on hand, ready to make yourself useful to the machine and back tenders while this work is going on. This will enable you to learn considerable of the duties pertaining to the position of back tender, which is the next step in your advancement, and the position which you should be ready to fill at any time the opportunity offers. You are the back tender's understudy, therefore you should be ready to play the part at a moment's notice. The real measure of your efficiency is, how much assistance you give the machine and back tenders, in case of mishaps, breaks, changing of the wires, felts or jackets; the care you exercise in removing all defective spots in the reel and the perfection of the splices you make; so that no complaints from the customers come into the front office about the paper made on your machine.

## Washup Duties

Whenever a washup is called for, you should be ready to double up the felts, and pull them out again after they have been washed, being very careful not to stand in front of the presses when doing so, as it may be the cause of serious injury or loss of life. Should the washing of the felts be finished before the wires are cleaned, give a hand on the wires, or do any other work that the machine tender believes needs immediate attention to permit of starting the machine in the shortest possible time.

When the back tender is putting the lever weights on the presses and calender, go right along with him and assist him in making the necessary adjustment, after you have made sure that the doctors on all the press rolls are cleaned thoroughly.

## Starting Up

After the paper is on the wire, it is your duty to be prepared and ready to skin a tail for the back tender, to enable him to lead the paper over the dryers. This should be done quickly and accurately so that it will not break and have to start over again, losing a lot of valuable time. Just as soon as the paper has been taken over the dryers, take your station in front of the calenders, ready to pass the paper through the calender stack, being extremely careful when throwing the paper into the calender rolls, not to get your fingers pinched. When the paper has come through the last pair of calender rolls, help the back tender to get it started on the reel.

## Inspection

After the paper is started on the reel, inspect the rewind and slitters, reporting to the machine tender

any defects that may need repair or renewal. Measure the distance between the slitter knives very carefully, to see if the measurements conform with the sizes ordered on the machine order ticket, so that there will be no chance of slitting the rolls the wrong width. See that there are enough cores of the right diameter and width at hand, to last your full tour, and remove any oversize or bastard cores to prevent any of them from getting mixed with the right cores, being sure that you do not leave any standing on end, as they are apt to fall and injure somebody, and have a set of the proper sized cores placed on the shaft in line with the sheet. When the reel is full and the next reel started, get the full reel over to the rewind immediately, to prevent any possibility of the reels accumulating, which will cause confusion and delay trying to catch up again, being careful when transferring reels not to hook up the yoke shaft while the reel is still moving, be sure to wait until it is at rest.

## Making a Perfect Splice

Be sure that all crushed spots, slime holes, imperfect paper and breaks in the reel, are torn out and replaced by a good splice. This is one of your most important duties, as the finished paper is judged, in a large measure, by the kind of splices made, and it is up to you to make all your splices as perfect as possible, so that there will be no complaints from the customer on this score, as it reflects not only on the entire machine crew, but seriously injures the reputation of the mill. In making a splice be sure you always have in mind the following dont's, for it will then be well nigh impossible for you to make a poor splice:

## Don'ts

Don't lay the tape any closer than one-half inch to the trimned edge of sheet when making splice.

Don't trim the tail of the sheet any closer than one-half inch to the splice; trimming the sheet too close may cause the tape to squeeze out over the edge.

Don't let the tape lap over the edges of the reel, as it it will cause several thicknesses of paper to stick together when the roll is being unwound.

Don't try to seal a splice with a cold sealing iron, it can't be done.

Don't bring your iron across the splice with a hop, skip and a jump effect, but draw it slowly with the same amount of pressure throught the entire length of the splice.

Don't make a splice with the tail end out of true with the edges of the reel, as it will throw wrinkles in the sheet.

Don't forget to insert a flag to mark every splice you make in a roll.

## Correct Record of Finished Paper

After the rolls are run up to the right diameter, help to take them off and weighed, giving the correct weight to the back tender, who will write it down on the machine production chart for his tour of duty.

The real secret of successful accomplishment, for any third hand, is to always work with and never against the balance of the machine crew; never holding back when he can be of assistance to the machine or back tenders, and always being ready to instruct the fourth and fifth hands in the proper performance of their work. If this course is followed consistently, you will find that you are accomplishing more and better work with less effort for every one concerned, and that you will be slated to fill the next available opening for back tender. The crew wherein every member is properly trained in the performance of his duties and where they are always ready to assist one another in all emergencies, will accomplish its work with fewer mishaps and less confusion, which means with less effort on the part of the individual members composing the crew.

# The American Pulp and Paper Mill Superintendents' Association News

## The Second Meeting of the Association at Green Bay, Wis.,

### The Organization of the Northwestern Division, the Meeting of the Michigan Division at Kalamazoo, Aug. 19, and Some of the Coming Events

THE special meeting of the American Pulp and Paper Mill Superintendents' Association, held for the purpose of organizing the Northwestern Division, consisting of the superintendents from Wisconsin, Minnesota, Illinois and the northern peninsula of Michigan, was opened at Hotel Beaumont on July 31st at 9:30 a. m., with President F. C. Boyce presiding and forty-two members present.

The business brought before this first session of the meeting consisted of adopting various measures to assist the future development of the association, and discussion among the members on subjects that are of vital importance to the whole industry, such as Labor, Sulphite Pulp and kindred subjects.

The president then appointed all the members that were present from the states of Wisconsin, Minnesota, Illinois and the northern peninsula as a committee for the selection of officers for the Northwestern Division, and the meeting was adjourned at 12:30 p. m.

The association then attended a concert in the lobby of the Hotel Beaumont given by the Northern Paper Mills Band, under the direction of Professor Enna. The musical program given by these paper makers was in every way the equal, and in many ways superior, to any of the famously advertised concert bands.

What largely assisted the superintendents to appreciate fully the class of music that was rendered was the fact that they were given an opportunity to concentrate their thoughts upon the music, instead of having their attention divided between the music and some long-haired acrobat or contortionist. Professor Enna was not only a sane and bald individual, but the motions he used in directing the musicians were so conservative and poetical that they blended perfectly with the music and gave the audience the opportunity to concentrate their thoughts on the music. The band therefore merits every distinction and honor that may be given it, as this proves overwhelmingly that it stands upon its own merits and does not need a mountebank nor jumping-jack to pull it through by dividing the attention of the audience in order to cover up any errors in time or key.

Luncheon was served in the main dining room of the Hotel Beaumont at 1 p. m. At 2 p. m. the superintendents were taken to Bay View Beach by automobiles, where the educational program, consisting of the following addresses, was given:

Otto Kress, "The Dyes Used in Paper Industry."

Al Kroes, "Oiling the Safety Movement."
H. T. Spaulding, "Paper Mill Illumination."
W. C. Widney, "Testing Felts and Rubber Rolls."

That this program was of general interest was well evidenced by the number of questions that were asked the several speakers by the members. The meeting was adjourned at 7:15 p. m.

At 7:30 a banquet was served in the Bay View Park pavilion, at which 120 superintendents and friends were seated. While the banquet was not wet, neither was it entirely dry. It could more appropriately be termed damp, as there was considerable "near" beer in evidence.

The entertainment furnished for this occasion was a concert by the Northern Paper Mill Band and some vocal selections by four professional entertainers. After the cigars had been passed around, the diners settled back, expecting to be bombarded by a few hours of cut and dried oratory, but they were very pleasantly disappointed to find that they were not to be afflicted with that sort of punishment, as there was only one speaker called upon for any remarks, and he was a real artist in extemporaneous speaking. "The Future of American Industry," as delivered by Mr. Leonard E. Blackmer, was followed with very rapt attention and interest.

## Excerpts from Mr. Blackmer's Speech

In the field of industry there are in effect today new methods and new processes, time and energy savers, operating for the benefit of the whole. You men know that today you are employing new methods and new processes in the manufacture of paper that five or ten years ago were literally unheard of. You realize that with the wage systems and conditions now in effect that you are facing problems which a decade ago would have been scoffed at as improbable, if not impossible.

As a representative of the world's leading extension division of your state university, the University of Wisconsin, I am here to tell you that the change coming in the field of education is one that is lasting and ever increasing. It is with regret that I stand here tonight to address you, realizing that during the past week correspondence has come onto my desk informing me that the specific thing which I hoped to lay before you, a course of instruction along the lines of paper making and the history of the paper industry, is now an impossible thing for the leading extension division of the world to furnish you, and all because a few of the "green-eyed friends of the people" have seen fit to carry out a political policy.

Lastly the change is coming in the field of religion, and to those "Dough-Boys," and "Tommies," and "Blue Devils" who are returning to the sunny shores of America, to the cramped and crowded quarters of the British Isles, and to the sacred soil of the Republic of France, there remains the task of carrying the message of a new religion that shall sooner or later work its way into the very vitals of all society and create of man a better creature. And the vision which those boys are carrying back from the hellishness of the old world soil is the sight of Catholic chaplains taking the dying words of Protestants, and by the fitful glimmer of the candle in the dugout transmitting these words onto mud-stained paper to send to the loved ones at home. A vision of Y. M. C. A. men and Salvation Army men pressing the crucifix to the lips of dying Catholics. These are the sights that have created the change in the religious instincts and ideals of men who thought out as well as fought out humanity's battle across the water. And the result is that a change has come in the field of religion, and there now stands supreme above the cold and clammy church architecture of the past, the new religion of brotherhood with its great message of the democracy of God.

Although I hesitate to discuss with you at this time the labor situation, but I do say to you this one thing, as the power of an executive is based upon that practical foundation which finds its being in a law of human nature where the man at the desk realizes that he is the "big stick;" that he controls the wires; that he is operating the plant, why not in a specific manner give the workmen the opportunity to awaken that dormant power of genius and executive ability which perhaps rests under his oil-stained jacket? You ask me how. I will tell you. You superintendents and managers sit behind glass doors that bear your name; you occupy, perhaps, a desk within an enclosure. That desk bears a plate with your name in shining letters of brass or bronze. Why not put the same plate on William Smith's machine and let it tell the factory, which literally is his little world, that he is responsible for the output of that particular piece of machinery? Why not awaken that spark of executive ability and fan it into flame just the same as those who have been above you have awakened the same fires in your breast from which they and you have reaped the benefits?

A cabaret performance and dance wound up the day's program, and every superintendent present voted that it was the end of the most perfect day.

### August 1 Session

The morning business session was held in the Rotarian Room of the Hotel Beaumont, with President F. C. Boyce presiding.

The association gave a rising vote of thanks to the entertainment committee, composed of D. F. O'Connell, chairman; W. T. Fogarty and R. J. Cunningham, for the splendid work they had accomplished.

Honorary membership was then conferred upon Otto Kress, Al Kroes and L. E. Blackmer.

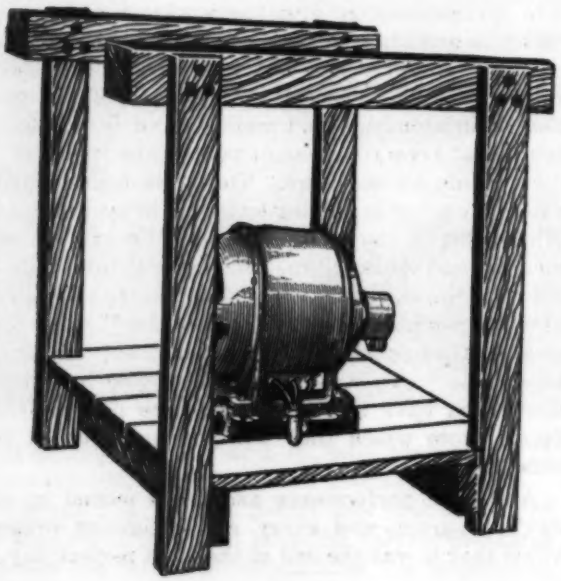
The business meeting of the association was then declared adjourned, and the meeting brought to

(Continued on page 387)

## Placing Your Motor on the Ceiling

When the Sigmund Ullman Ink Co. moved into their new quarters in Chicago, it became necessary to place their roller mills, for grinding their inks in two rows, in order to get the maximum efficiency with the minimum of labor.

To accomplish this in the space available, and still have sufficient room between the mills to allow freedom of movement for the operator, seemed an impossible task as the motors occupied all the space between the mills until the foreman suggested the very ingenious scheme of hanging the motors on the ceiling.



The idea suggested will be very interesting to our readers, because there are many instances where the Paper Industry can use an application of this idea to very good advantage.

The foreman's plan was simply to build a mezzanine floor or platform to accommodate the motors used for driving the roller mills, which would not only make all the space between the mills available to the crews, but would also cut down the number of motors needed, by using the gang drive in place of the individual drive for the mills.

By having an open space between each mill, the cleaning of the floor became a simple matter and would have been impossible with the motors on the same plane with the mills as the propections from the motor base and the safety guards would have acted as good dirt catches, preventing the broom or mop from accomplishing their mission.

The roller mills, being now arranged as originally planned, permit the workmen to perform their duties, with that freedom and safety of movement that always spells efficiency, and which would otherwise have been impossible without this arrangement in the space available.

This plan has now been installed for the last two months and has performed all that was expected of it with perfect satisfaction to all concerned.

Just think this simple little idea over and see if you cannot think of some place in your plant or mill where you can apply it to very good advantage, perhaps you may right now be able to use it on the floor beneath the machine room, for the pump, saveall or other small motors now on the floor where it will not only remove some of your safety hazards, but will protect your motors from damage by water, and permit them to function for you efficiently.

---

## Power Troubles

Wasted power anywhere and everywhere throughout your plant, is a drainage that should be stopped. There are dozens of causes for power losses, leaky packing, misalignment of shafting, leakage through boiler walls, slipping belts, improper lubrication, poor insulation, bearing troubles, boiler scale, coal burned with insufficient draft, and innumerable others; in fact, the waste from your steam generating plant may easily or does exceed all of your other power wastes put together. If you wish to find out just how efficient your power plant is, investigate how many pounds of paper you can make per pound of coal and you will have the real value of your power plant efficiency.

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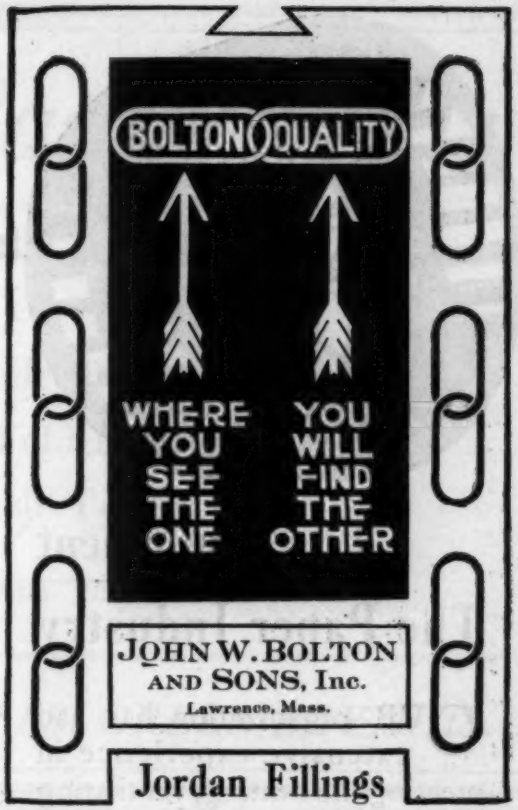

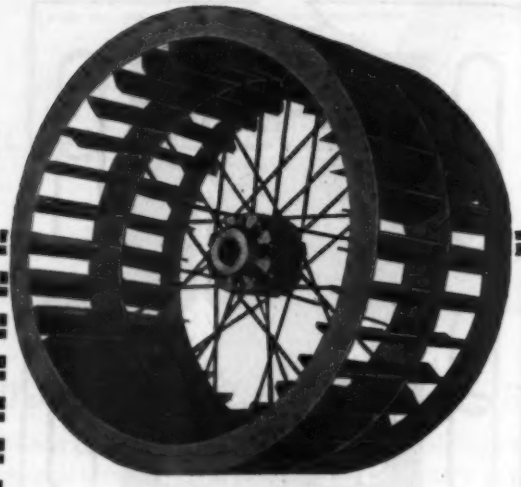

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FOR
## The Paper Industry

OUR organization has had extensive experience in meeting the heating, ventilating and drying requirements of paper mills.

*We can design, manufacture and install equipments which will give most efficient service in your mill.*

Among the successful applications of of Bayley equipment to paper mill needs are Forced and Induced Draft Systems, Pneumatic Chip Ash Handling Systems, Cooling Systems for Electric Generators and for Calenders, Absorption Systems, Forced Ventilating Systems, Dust Collecting Systems, etc.

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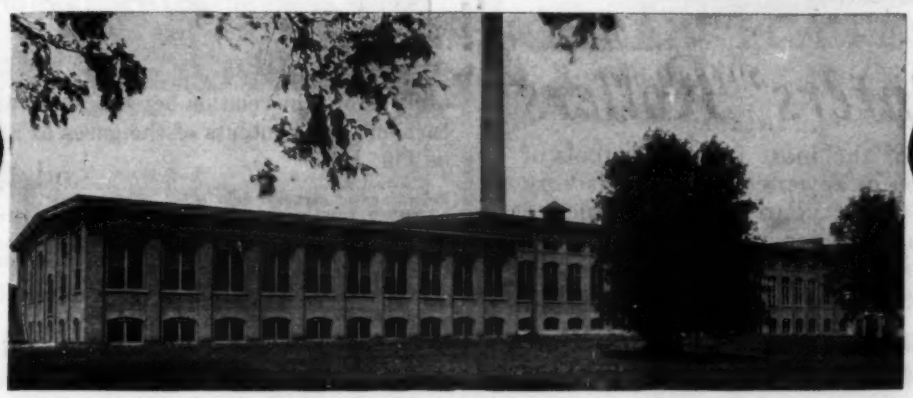

The Symbol of Quality

The Symbol of Quality

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*From a Jobber:*

*"We are enclosing an order for two additional cars and think it would be well to add that your paper has been running very satisfactory and that it will probably be some little satisfaction to you to know that we are thoroughly satisfied with this sheet and think it well to give you a word of praise."*

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Are one of the most important tools of production in any pressroom. It is very important that your rollers be able to "stand up" under your conditions in order to enable you to produce GOOD PRINTING ECONOMICALLY.

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# American Printers' Roller Mfg. Co.

316 W. Grand Ave., Chicago, Ill.


## Carbon Dioxide and Sulphur Dioxide Recorder

To obtain economic combustion it is necessary, that the quantity of air conveyed to the furnace should be so regulated that complete combustion takes place, without there being any unnecessary surplus of air. If too much air is introduced the combustion gases will be cooled and cause a waste of heating power.

Too much air will give a low percentage of carbonic acid in the combustion gases. The following

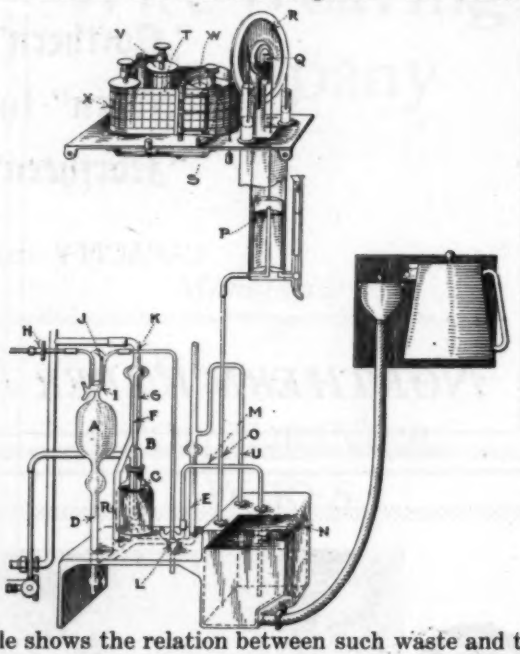


table shows the relation between such waste and the carbonic acid contents of the gases at a temperature of 450° Fah.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| the fuel | | | | | | 81 % | 41 % |
| Percentage of carbonic acid ($CO_2$) in the combustion gases | | | | | | 2.0% | 4.0% |
| Corresponding total loss in the calorific value of | | | | | | | |
| 6.0% | 8.0% | 10.0% | 12.0% | 14.0% | 16.0% | 18.0% | |
| 27 % | 20 % | 16 % | 14 % | 12 % | 10 % | 9 % | |

This table shows that great waste of fuel can take place by means of injudicious firing, or incorrect firing, however well the plant may be laid out.

Often a large amount of capital has been expended on the plant with the object of attaining a good economy; economisers, superheaters, or automatic stokers are put in, the engines are constructed with two or three cylinders, furnished with valve gear and expensive condensation plants.

All these fuel-saving devices can by no means repair the loss caused by incorrect firing.

The Mono Apparatus for the Control of Combustion consists of an absorption-apparatus and a register, mounted in a cast-iron cupboard. A filling device for the absorption liquid, a moisture regulator, a filter, a gas-receiver and tubing are in some cases included in the delivery.

Either water pressure or compressed air may be

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Roughly speaking, the best board carton protects the contents, but it does not preserve the **finer** distinguishing aroma or flavor or moistness of the food from the time it leaves the baker until dispensed in the home, unless sealed in waxed paper.

The **success** of the food is built on its quality. Why not insure its success?

Send for samples of self-sealing waxed paper—and while you are writing, permit us to mail you test sheets of KVP Vegetable Parchment—the paper that is "Better wet than dry."

**KALAMAZOO VEGETABLE PARCHMENT COMPANY**
**KALAMAZOO, MICHIGAN**
*World's Model Paper Mill*
Makers of bond and waxed paper and vegetable parchment

# DANIEL M. HICKS
(INCORPORATED)
IMPORTERS DEALERS
ESTABLISHED 1895

# "Quality"

140 NASSAU ST. NEW YORK U.S.A.

# SCREEN PLATES *and* DANDY ROLLS

*Watermarking a Specialty*

## Central Manufacturing Co.

*The Quick Service House*
KALAMAZOO MICHIGAN

# WE-FU-GO AND SCAIFE WATER

PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO., PITTSBURGH, PA.

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Cut down *excessive* wrapping paper investment. Why carry two wrapping paper lines for one wrapping paper *purpose?*

**MOSINEE**

presents a perfect wrapping paper, weight and strength for each wrapping purpose. Made in all weights from 15 pounds to 100 pounds basis. The one complete, standardized and economical line of wrapping paper sold.

**Mosinee Kraft**

***"The Wrapper that Delivers the Goods"***

used as driving power, depending on the local conditions. In the latter case a special air-compressor with hand-pump is used, if compressed air is not otherwise obtainable.

There is no water or other injector used with this instrument to draw the gases from their respective sources. The pipe line employed for connecting the instrument with the furnaces consists of $\frac{1}{8}$-in. copper or brass tubing. In order to prevent clogging of the $\frac{1}{8}$-in. pipe with soot, a simple cotton-waste filter is placed at the intake of each flue, and owing to the intermittent pull of a mercury column within the recorder, just the volume of gas required for analysis is drawn into the instrument. If clogging of the pipe should occur (in cases where a very high volatile coal is used), there will be no faulty recording, as the machine will instantly stop and the operator will immediately know the cause of the trouble. The 50 ft. of piping as used with this instrument contains about the same volume of gas as that of the burette in the instrument. Thus if the burette fills and empties itself only once—that is, after the first cycle—the correct sample as existing in the flue is being analyzed. Inasmuch as the instrument can be operated so as to record more than 60 analyses an hour, it will be seen that the lag does not exceed one minute when 50 ft. of pipe is used. As this heavy pull could not be accomplished by a column of water, mercury is used.

This understanding of the $CO_2$ recorder will assist in making clear the operation of the $SO_2$ recorder as the same instrument is used, only that the parts subject to corrosion from the acid fumes are made of sulphur dioxide resisting materials.

A caustic-potash solution of the specific gravity of 1.27 Baume is used the same as in the $CO_2$ recorder in all cases where the gas to be analyzed does not show any measurable quantities of $CO_3$ and $SO_3$, which would also be absorbed by the caustic-potash solution and thus give an erroneous result. In case where $SO_2$, together with volumes of $SO_3$ and $CO_2$ are present, caustic-potash as an absorbent can not be used, and for such cases a special recorder is made, using an iodine solution which will absorb only the $SO_2$, thus giving a correct analysis of this gas. Owing to the use of such iodine solution, the gasometer is built of glass. These instruments are mostly used in sulphite mills of the paper industry.

These instruments, including the oxygen recorder, can make over 60 analyses per hour without impairing their accuracy.

An inducement that will start the men thinking as to whether they are doing their work in the best possible manner is a very good investment. After they begin to give their duties a little more headwork, it will become a much better place to work in and it will assist in bringing about that satisfaction among the employes that only comes with appreciation of effort.

## Your Problem Solved

Nearly every mill has some place where a ventilating fan is needed. The conditions demand it and the business is suffering for the lack of it.

BUT! It seems impossible to find a place for the fan where any drive can be connected to it, or else the machines in the room are taking all the power available so that a fan cannot be added to the present load.

STYLE H K

## The Perkins Direct Connected Electric Fan

can be put just where it will do the most good, regardless of the driving arrangements. You can get the wires to it anywhere. The controlling switch can be placed at any distance from the fan, wherever it is most convenient to operate. You will be surprised to find what a small amount of power will drive one of these fans. They are built for any kind of electric current and to suit practically any conditions of installation. Get our Special Circular for future reference. You may need it tomorrow if not today.

**B. F. Perkins & Son, Inc., Holyoke, Mass.**

## The C. L. La Boiteaux Co.

Cincinnati Chicago Cleveland New York

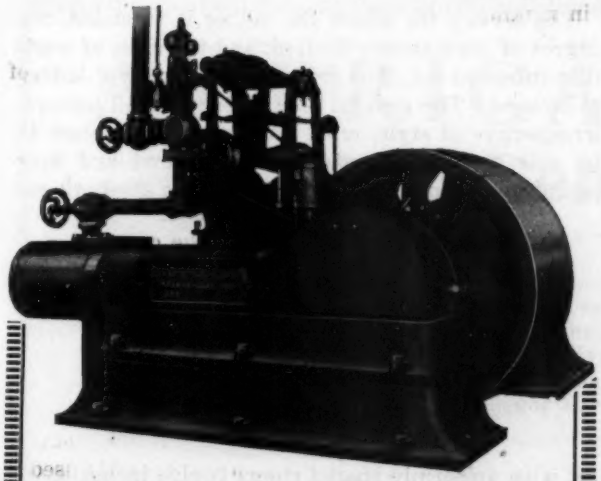
TRADE MARK L^x QUALITY SERVICE

## PAPER BOX BOARDS

— FOR —

*Folding Boxes, Set up Boxes, Paper Cans, Shipping Containers, Etc.*

| | |
|---|---|
| *Plain Strawboard* | *Solid Manila Tag Board* |
| *News Lined Strawboard* | *Brown Jute Box Board* |
| *Book Lined Strawboard* | *Oak Grained Jute Box Board* |
| *Plain and Lined Chip Board* | *Marble Grained Jute Box Board* |
| *Single and Double Manila Lined News and Chip Board* | *Pasted Container Board* |
| *Patent Coated Folding Box Board* | *Bristol Ticket Board* |
| *Clay Coated Folding Box Board* | *Diamond Wall Board* |
| | *Champion All Leather Heel Board* |
| | *Also other standard and special grades to order* |



## Variable and Constant SPEED ENGINES

*Paper Mill Economy* is assisted very materially by the installation of High Grade Variable Speed and Constant Speed Engines.

*Send for List of Installations and Catalogs*

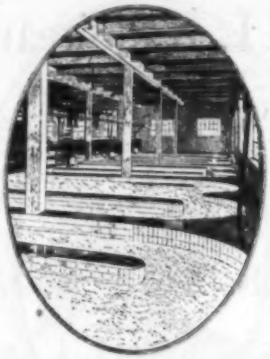
**CHANDLER & TAYLOR COMPANY**
**Indianapolis, Indiana**

## White's Chipper Knives

Real Knives that do real work. No experimenting here. Ask almost any of the larger mills.

*Write for our prices*

**The L. & I. J. White Co.**
**85 Columbia Street, BUFFALO, N. Y.**



High Grade
Bleached
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Furnished in Rolls—75% Air Dried or in Wet Laps

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Eastern Manufacturing Company
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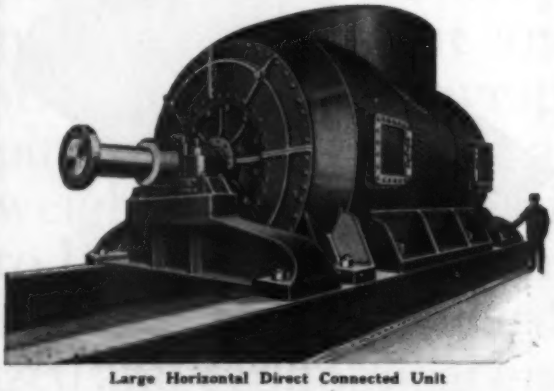
*Mills at Bangor and Lincoln, Maine*

Leffel Turbine Water Wheels

*High Speed — High Horsepower — High Efficiency*

Vertical and Horizontal Designs



Large Horizontal Direct Connected Unit

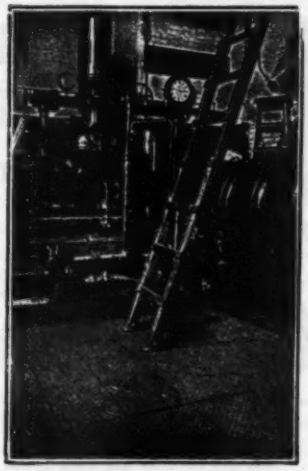
*Write for Bulletin 54*

*The* JAMES LEFFEL & CO.
SPRINGFIELD, OHIO

SALES ENGINEERS
B. F. Groff, 558 Woolworth Bldg., Lancaster, Pa.
L. B. Dow, Inc., 79 Milk Street, Boston, Mass.
H. H. White, 1503 Fourth Nat'l Bank Bldg., Atlanta, Ga.
William Hamilton Co., Ltd., Peterboro, Ont., Canada.

## Ladder Safety

Ladders are responsible for a large number of accidents, yet it is very seldom that they get the necessary attention to make them safe. While the best safety rule would be to do away entirely with their use, especially the portable ladders, there are certain conditions where they are an absolute neces-



sity. The next best thing is to make the ladders safe for the workmen's use.

It is neither difficult, nor expensive, to construct ladders that will be safe and to train the workmen in their use.

The service for which the ladder is intended, the degree of permanency desired, and the class of work it is intended for, will determine the kind of ladder to be used. The general requirements of all ladders, irrespective of style, must have strength enough to be able to bear a load of four hundred and fifty pounds, wide enough for a man to move freely there-

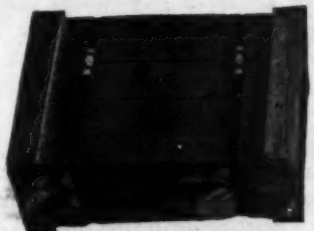
on, with uniformly spaced rungs twelve inches apart and of twenty-four inch length.

Safety feet or devices to prevent slipping should be attached to the bottom of every portable ladder.

No one type of ladder foot has been found suitable under all conditions of service. Many different types have been developed and type best suited to service required should be chosen.

In general it may be said that for use on rough or wooden floors ladder feet having one or more sharp spikes or having flat lead-coated bottoms will be found suitable. For use on wet and relatively smooth floors, ladder feet having recessed rubber bottoms

## SIGNODE SYSTEM



Framed Reams, strapped with Signode System

The Signode System delivers Framed Reams, Cases and Bales of Paper with the square corners in perfect condition.

Write for Particulars and Prices

**The Signode System, Inc.**
564 W. Adams Street CHICAGO, ILL.

## Plate Press Felts

There is no better Plate Press Felt made than the "HAMILTON."

A trial is invited.

*Satisfaction always guaranteed.*

**SHULER & BENNINGHOFEN**
HAMILTON, OHIO

## WOLVERINE
## Paper Company

*"Wolverine" Waxed Papers for Every Requirement*

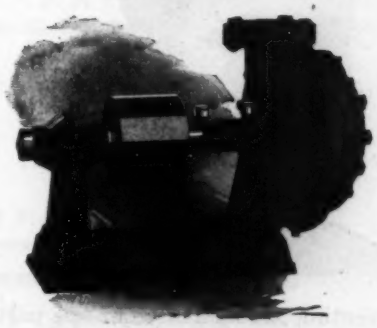
Best Quality

*Waxed Tissue a Specialty*

**OTSEGO, MICHIGAN**

## AMERICAN-MARSH
## Centrifugal Pumps

*BELT OR MOTOR DRIVEN*

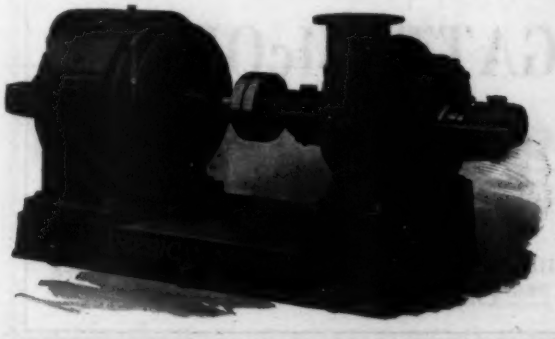


Extra wide ring oiled bearings. Overhanging casing allowing the discharge to be taken at any angle desired. Removable outer head so that impeller may be withdrawn without disturbing the casing. Hydraulically balanced impeller insuring minimum end thrust. Impeller machined all over and turned to make a close running fit with the casing.

Finished with open runner for handling paper stock.

*INVESTIGATE. ASK FOR BULLETIN No. 25.*
*Furnished Promptly Upon Request.*

*We Also Manufacture* **Power Pumps, Deep Well Pumps, Boiler Feed Pumps, Vacuum Pumps, Horizontal Power Air Compressors.**



**American Steam Pump Co.**
**Battle Creek, Michigan**
*Chicago Office,* 1220 Monadnock Block.
*New York Office,* Whitehall Building, 17 Battery Place.

# GATTI-McQUADE COMPANY

JOSEPH GATTI, *President*

Established 1894 Incorporated 1898

*Tell Us Your Problems in*

**Paper Manufacturers' Supplies**

¶ We have the EQUIPMENT to handle any TONNAGE you may desire.

¶ We are in a POSITION to give you the exact GRADE you require.

¶ Our CAREFUL GRADING assures you of UNIFORMITY.

¶ Our SORTING is done under SANITARY conditions in 2 large MODERN WAREHOUSES.

*Every Standard Grade of*

**Rags, Paper Stock**

**Cotton & Woolen Waste**

*We also carry a full line of*

Kraft, Sulphite, Manila and Waterproof Wrapping Papers.

Straw, Binders, Chip, Lined and Coated Box Board.

Cotton, Hemp and Manila Cordage.

# GATTI-McQUADE COMPANY

JOSEPH GATTI, *President*

Main Office: 200 Fifth Ave., New York City

WAREHOUSES:

Hoboken, New Jersey, Weehawken, New Jersey

Philadelphia Office: 1416 Wood St.


have been found of service. For use on concrete and rough iron floors, ladder feet having contact surfaces in which particles of abrasive substances such as carborundum are partly embedded as here illustrated, have been found suitable. Ladder feet having lead-covered bases are also suitable for use on concrete floors.

Ladder feet should be renewed when worn or otherwise kept in proper condition in order to perform their proper functions. Spiked feet will wear and lose their sharpness. Suction-grip feet depend on an even contact of their bottoms surrounding the recessed portions so as to exert a suction effort; accordingly wear and damage resulting in unevenness may soon destroy their effectiveness. Lead-coated feet may wear or become smooth and offer less slipping resistance. Abrasive-studded feet may have particles of abrasive broken off or may become clogged with foreign material and thereby lose their effectiveness.

## Respirators

The accompanying illustration shows a respirator that will provide protection for the worker in the rag and paper sorting rooms from the irritation of the infectious dust hazard, that is always present in this class of work.

It is indispensable to the workers handling soda ash and other chemicals where it affords good protection by preventing the inhalation of fine particles that generally fill the air when material of this kind is being handled.

In the bleach room or wherever bleach powder is being handled it has proved sufficiently effective to have practically eliminated loss of time by the workers through the ill effects experienced from inhaling the bleaching powder and chlorine gas.

Layoffs and absenteeism are the result of some cause. Insufficient protection from various dust hazards is one of the causes, the removal of which, through proper protection, will considerably reduce layoffs and lost time.

## Hall, Ward & Walker
(INCORPORATED)

## *We Guarantee*

¶ Standard news with less than 10% Sulphite, a yield of more than 2200 lbs. per cord peeled or prepared wood and at less than 65 H. P. per ton.

¶ Installations made without interruption of manufacture and for time of men and expenses only. No charge whatever unless guaranty fulfilled. License fee 10% of saving made or 20 cents per cord at licensee's option.

**HALL, WARD & WALKER, Inc.**
Sherman Building
WATERTOWN, N. Y.

## Ticonderoga Machine Works
TICONDEROGA, N. Y., U. S. A.
*MANUFACTURERS OF*
WARREN IMPROVED CALENDER DOCTORS
*With Flexible Blades, Universal Adjustment and Control*
(PATENTED)
WARREN IMPROVED PATENT DOUBLE DRUM WINDERS
Patent BALL VALVE Hydrant
Stock Circulating Systems *and*
other Paper Mill Specialties
*SEND FOR OUR BULLETIN*

## *H. O. NUMAN*

## Barking Drums

*Green Bay, Wis.*

CHAS. A. DEWING, President
A. G. GILMAN, Vice-Pres. and Gen'l Mgr.
JOHN A. PYL, Sec'y and Treas.
JOHN W. POWELL, Sales Manager

## 1919
## THE RECONSTRUCTION YEAR

YOUR LINES can be
strengthened by adopting

# Monarch Standardized Lines

**C1S Litho, Label and Music**
**Ideal Enamel**
**Mohawk Enamel**
**Utility Enamel**
**Mastercraft Enamel**

*OFFSET PAPERS:*
**Bulking Eggshell**
**Offset Music**

## Monarch Paper Co.
## Kalamazoo Mich.

**3 Paper Machines** **15 Coating Machines**

# Bardeen Paper Co.

Otsego, Mich.

*Printing Papers of Merit*

*For* LETTERPRESS, OFFSET *and* LITHOGRAPHIC PRINTING

Offset Blanks Offset Bristols

Porcelain, Peninsular and Purity Enamel Book

M.F. and S&SC Book and Catalog

English Finish Opaque

Coated Blanks

Post Card Translucent

THE HILL CLUTCH CO

**YOUR LINE SHAFT EQUIPMENT**

Should combine highest efficiency with dependability and low cost of upkeep.

Our complete line of

**Power Transmission Machinery**

is designed to combine strength and efficiency

**HILL** FRICTION CLUTCHES
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**THE HILL CLUTCH CO.**

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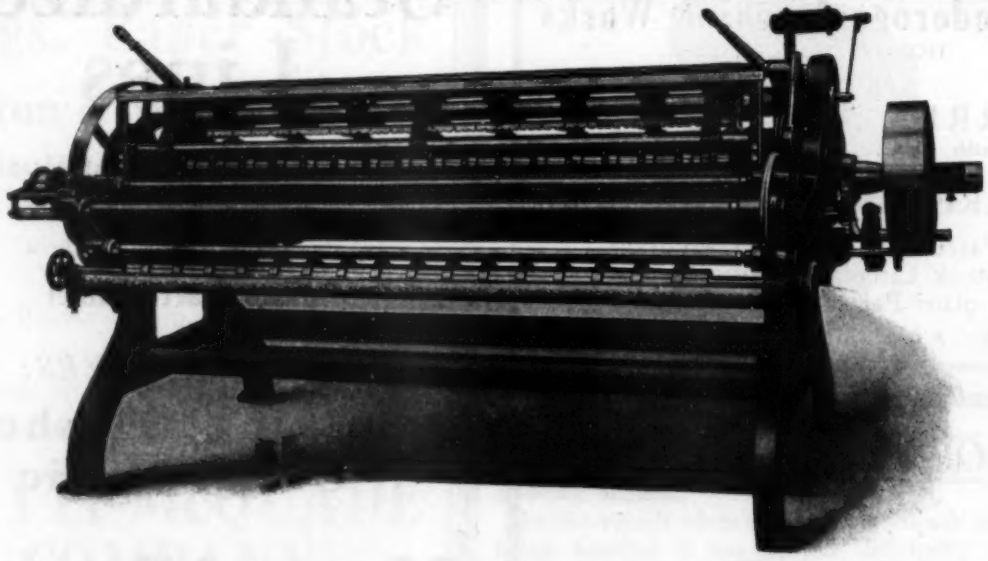
New York Office: 50 Church Street



*For Increased Production and Reduced Manufacturing Cost—Use*

**Hudson-Sharp Rapid Winding Toilet Paper Machines**

UP-TO-DATE IN EVERY RESPECT——————*WRITE FOR CATALOG*

**Hudson-Sharp Machine Co.,** Green Bay, Wisconsin

GIBBS-BROWER CO., *Eastern Selling Agents*
261 Broadway, New York, N. Y.

(*Continued from page 373*)

order by Mr. Boyce acting as temporary chairman, who gave an outline of the work to be done by the Northwestern Division, such as the nomination and election of officers and the adoption of by-laws.

Mr. Paul A. Smith and Mr. George Bonner were appointed as tellers. The result of the nominations and election of officers for the Northwestern Division was as follows:

Chairman, Mr. R. J. Cunningham, superintendent of the Northern Mills Paper Co., Green Bay, Wis.

Vice-Chairman, Mr. W. K. MacNair, superintendent of the Northwest Paper Co., Cloquet, Minn.

Secretary-treasurer, Mr. J. T. Mader, superintendent of the Menasha Printing & Carton Co., Menasha, Wis.

The officers-elect then assumed their duties and conducted the balance of the meeting for the Northwestern Division.

Mr. F. C. Boyce extended an invitation to the division to hold its next meeting at Wausau, Wis., and the invitation was accepted.

Chairman Cunningham then appointed Mr. Henry Bert, of the Downing Box Co.; Mr. Kelley, of the Marathon Paper Mills Co., and Mr. Sievert, of the Marinette & Menominee Paper Co., as a committee to go into executive session for the purpose of choosing a suitable date for the next meeting of the division.

October fourth was given as the committee report, and was adopted by the division as the date of its next meeting, to be held at Wausau, Wis.

The by-laws to govern the division were submitted by Mr. Wm. T. Fogarty, the chairman of the by-laws committee, and were approved and adopted as read.

A vote of thanks was given to the gentlemen who composed the Green Bay reception committee for all the courtesies shown and the assistance rendered to the association's entertainment committee and the secretary was instructed to inform the following gentlemen:

P. S. Wagner, general manager of the Northern Paper Mills.

Ray North, general manager of the Green Bay Foundry & Machine Co.

Frank Hoberg, general manager of the John Hoberg Paper Co.

John Welsh, general manager of the Green Bay Paper & Fibre Co.

The meeting was adjourned at noon and a sightseeing automobile trip of Green Bay was taken, after which the party reassembled at De Lair's cafe for luncheon at 1:15 p. m.

Luncheon was served at 1:30 p. m., and at 2:30 p. m. the meeting was called to order for the open meeting, at which time the following addresses were given:

A. L. Kaems, "Industrial Relations."

A. S. Pritchard, "Paper Mill Lubrication."

(*Continued on page 393*)

**Handling Materials at the Mill**

IS YOURS one of the many mills which handles considerable pulp? Some of these have found it to be more rapid and economical to do this handling with a Brownhoist locomotive crane. A Brownhoist will not only place the pulp wherever it is needed, but will handle your coal, switch the cars and take care of innumerable jobs which come up around the yard. If you have much handling to do, our long crane experience should be of use to you. We will gladly give you any information for the asking.

*The*
**Brown Hoisting Machinery Co.**
*CLEVELAND, OHIO, U.S.A.*

*Engineers and Manufacturers of Heavy Dock Machinery Bridge Cranes, etc., as well as smaller Cranes and Hoists*

Branch Offices in New York, Pittsburgh, Chicago and San Francisco.

**E. B. THOMAS & CO.**
INCORPORATED
ALFRED J. MORAN, Manager
100 Hudson St., NEW YORK

IMPORT EXPORT

*HIGH GRADE*
*Paper Manufacturers' Supplies*

RAGS—PAPERSTOCK
ROPE—BAGGING
STRINGS

INQUIRIES INVITED

**FRANCIS HUGHES COMPANY**

*Paper Mill Supplies*

CORRESPONDENCE SOLICITED

*Private Switch on C. B. & Q. Tracks*

21st Street at Loomis
CHICAGO, ILLINOIS

**Main Paper Stock Co.**
Incorporated
PACKERS OF WASTE PAPER STOCK
Old and New Rags, Bagging, Strings, Etc.

*Importers—Exporters*
Daily Capacity 300 Tons

Branches:
321 Pearl Street
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*Established 1885* *LONG DISTANCE PHONES Harrison 5557-2840*

**—*To* PAPER Manufacturers**

*Here is a message of interest for you.*

¶ We pack forty different grades of Paper Stock.

¶ Our Daily Capacity is 300,000 pounds.

¶ We can give you both Quality and Quantity.

*Send us your inquiries on the grades you want to use in your product.*

**MENDELSON BROS. PAPER STOCK CO.**
*General Offices,* STANDARD OIL BUILDING
910 South Michigan Boulevard, CHICAGO

*"The house with whom you eventually will trade"*

Reasons for using our domestic
**Washed Clay**

**QUANTITY:** Largest production in United States.

**QUALITY:** Lowest grit and moisture contents of any clay, domestic or foreign.

**DELIVERIES:** Reserve stock never under 6000 tons.

**PLANTS:** Three huge plants at McIntyre, Ga., under direct control of Edgar Bros. Co., also Saylorsburg, Pa., and Gordon, Ga.

**CRUDE CLAY:** Paragon and Excelsior Brands.

**MINER-EDGAR CO.**
30 Church St. New York

## Papermaking Rags

The rag market is in a very firm position. Manufacturers are placing orders in a consistent manner for fairly large amounts of the various grades and the price changes which have occurred during the past several weeks have, practically without exception, been in an upward direction. Supplies from foreign sources are arriving in increasing volume, yet this factor seemingly is having no influence on the domestic situation, as consumption appears to be of such magnitude as to provide a ready market for all of the rags available. A feature at present is the strength in new cuttings. Offerings of these by dealers are being quickly absorbed and sellers are repeatedly advancing their prices, maintaining that they are unable to replace the stock disposed of at anywhere near the figures they previously have paid.

| | |
|---|---|
| New Stock— | |
| White shirt cuttings, No. 1 | 15.00-15.50 |
| White shirt cuttings, No. 2 | 9.00- 9.25 |
| Fancy shirt cuttings | 11.00-11.50 |
| Washables, No. 1 | 9.25- 9.50 |
| Unbleached muslins | 13.00-13.50 |
| White lawns | 13.25-13.50 |
| Overall cuttings, blue | 10.75-11.00 |
| Black silesias | 6.00- 6.25 |
| Old Stock— | |
| Whites, No. 1 repacked | 7.00- 7.25 |
| Whites, No. 2 repacked | 5.25- 5.50 |
| Whites, house soiled | 4.00- 4.25 |
| Whites, street soiled | 3.50- 3.75 |
| Thirds and blues, repacked | 4.25- 4.50 |
| Thirds and blues, rough | 3.75- 4.00 |
| Black stockings | 3.60- 3.80 |
| Lace curtains | 7.00- 7.25 |
| Cotton canvas, No. 1 | 5.00- 5.25 |
| White cotton batting | 5.25- 5.50 |
| Roofing, No. 1 | 3.00- 3.10 |
| Roofing, No. 2 | 2.90- 3.00 |

## Old Papers

Consumers of old paper are purchasing fairly heavy quantities in a steady way and the market is possessed of a firm undertone, prices on most grades having climbed during the past month. Demand for book stock continues to be one of the outstanding features of the market. Western and Eastern mills alike are actively seeking supplies and are paying very attractive prices for the material desired. Heavy No. 1 books are selling at 2.25 cents a pound at the point of shipment, while crumpled book stock is moving freely at around 1.75 cents. Book paper manufacturers also are purchasing sizable amounts of soft white shavings, No. 1 packing of which commands 4 cents and higher f. o. b. shipping point. Hard white shavings, on the other hand, are not in as good demand, though dealers are holding unsold stocks firmly and prices have risen in sympathy with other grades. Kraft and manila papers are moving in fair volume and at enhanced values. No. 1 mixed paper is fetching 65 to 70 cents per 100 pounds in sales to board mills, and flat folded newspapers 75 to 80 cents, with current demand chiefly for the former. Prices f. o. b. New York follow:

| | New York and Chicago |
|---|---|
| Hard white shavings, No. 1 | 5.00-5.25 |
| Hard white shavings, No. 2-3 | 4.25-4.50 |
| Soft white shavings | 4.00-4.25 |
| Colored shavings | 1.50-1.75 |
| Heavy book, No. 1 | 2.20-2.30 |
| Crumpled, No. 1 | 1.60-1.75 |
| Ledger stock | 2.40-2.60 |
| Kraft, No. 1 | 3.00-3.25 |
| Manilas, No. 1 | 1.10-1.25 |
| White blank news | 1.30-1.40 |
| Overissue news, No. 1 | .95-1.00 |
| Folded news | .75- .80 |
| Mill wrappers | .90-1.00 |
| Box board cuttings | .70- .75 |
| Mixed paper, No. 1 | .65- .70 |
| Common paper | .40- .45 |

## Rope and Bagging

Firmness characterizes the market for old rope and bagging and prices are gradually advancing under an increasing movement of supplies into consuming channels. Demand for scrap bagging has improved to a pointed degree during the past several weeks and sellers have repeatedly jacked up quotations until now No. 1 scrap is scarcely to be had.

| | New York and Chicago |
|---|---|
| Gunny, No. 1 domestic | 3.50-3.75 |
| Gunny, No. 1 foreign | 3.50-3.75 |
| Scrap bagging, No. 1 | 2.90-3.15 |
| Roofing bagging | 2.50-2.60 |
| Wool tares, heavy | 3.40-3.60 |
| Wool tares, light | 3.20-3.40 |
| Manila rope, No. 1 foreign | 5.75-6.00 |
| Manila rope, No. 1 domestic | 5.75-6.00 |
| Sisal strings | 2.60-2.80 |
| Mixed strings | 2.50-2.65 |

Phones 3074 3075 Murray Hill

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CHEMICAL WOOD PULP
*of* ALL KINDS

*Dealers in*
Domestic Sulphites, Kraft Pulps
and GROUND WOOD

*Agents for* PAPER MILL SUPPLIES

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## Importers of Chemical Pulps
BLEACHED AND UNBLEACHED

Agents for Kellner Partington Paper Pulp Co., Ltd.
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EASY BLEACHING SULPHITE AND KRAFT PULP

*Also*

ATLANTIC PAPER & PULP CORP.
Savannah, Ga.

KRAFT PULP

N.O.C. N.O.C.

NEW YORK OVERSEA CO. INC.

*Importers and Exporters of*

WOOD PULP and PAPER

*Offices located all over the World*

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| Stockholm | Teneriffe |
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| Genoa | Hong-Kong |
| San Francisco | Shanghai |
| Las Palmas | Tientsin |
| Calcutta | Batavia |
| Samarang | Durban |
| Surabaya | Cape Town |
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NEW YORK 17 BATTERY PL. U.S.A.

N.O.C. N.O.C.

The Bryant Paper Company, Kalamazoo, Michigan, had good reasons for equipping all five of their plants with

# AMERICAN
## STEAM ASH CONVEYORS

Their ashes are handled quickly, efficiently and economically—money is saved. Conveyor fully described in catalogue P, free on request.

**American Steam Conveyor Corporation**
*Ash Disposal Engineers*
CHICAGO: 326 West Madison Street
NEW YORK: 110 West 40th Street
Sales Engineering Offices in Principal Cities

## New Papers

| | |
|---|---|
| Writing— | |
| White rag | 20-40 |
| White sulphite, No. 1 | 12-20 |
| Colored | 14-23 |
| Ledger— | |
| White rag | 20-42 |
| White sulphite | 14-22 |
| Colored sulphite | 16- |
| Colored rag | 22- |
| Bonds— | |
| White rag | 17-47 |
| White sulphite | 13-22 |
| Colored sulphite | 14-26 |
| Colored rag | 17-50 |
| Book— | |
| No. 1 S. & S. C. | 9.00-10.00 |
| Machine finished | 8.50- 9.50 |
| English finished | 9.00-12.00 |
| Coated and enamel | 10.50-14.00 |
| Lithograph, M. F. | 8.75-12.00 |
| News Print— | |
| Rolls, contract | 3.75- 4.00 |
| Rolls, transient | 4.00- 4.25 |
| Sheets | 4.50- 4.75 |
| Side runs | 3.75- 4.00 |
| Cover Stock— | |
| Coated, both sides | 12.25- |
| Coated, one side | 12.00- |
| Wrappings— | |
| No. 1 kraft | 8.00- 8.50 |
| No. 2 kraft | 7.00- 7.50 |

| Boards— | New York | Chicago |
|---|---|---|
| Solid news | 55.00-60.00 | 55.00-60.00 |
| Straw | 40.00-45.00 | 40.00-45.00 |
| Plain chip | 50.00-55.00 | 50.00-55.00 |
| White coated chip | 65.00-70.00 | 65.00-70.00 |
| Manila coated chip | 65.00-70.00 | 65.00-70.00 |
| Binders board | 70.00-75.00 | 75.00-80.00 |

## Mechanical Pulp

Manufacturers of Mechanical Wood Pulp with few exceptions are now quoting $30 a ton at the grinding mill for No. 1 spruce pulp, and although occasional sales are reported at prices a dollar or two under this figure, sizable tonnage are firmly held for the higher price. Demand is active and is steadily broadening, reflecting the brisk activity in the news print market. Production is hampered by a growing shortage of pulp wood and mid-summer droughts, which tends to have a bullish influence on values.

## Chemical Pulp

Business of broader scope than has been evident in some time has been transacted in domestic chemical wood pulp during the past month, and, spurred on by the steady expansion of demand from consuming quarters, prices have undergone advancement. Many pulp manufacturers have their output for several months ahead sold and are now out of the market, preferring not to accept further orders. Bleached sulphite of No. 1 grade is practically unobtainable in sizable tonnage at the present time at less than 6 cents at the pulp mill. News grade unbleached sulphite is firmly held at $70 to $75 per ton, while easy bleaching sulphite is selling freely at about $90 on contract and up $100 for spot lots. Kraft is quotably higher, revised prices ranging from $85 to $95 a ton at the pulp mill, and sulphite screenings are priced at a minimum of $30 with many producers asking $35. Quotations f. o. b. pulp mills follow:

| | |
|---|---|
| Bleached sulphite | 6.00-6.25 |
| Easy bleaching sulphite | 4.50-5.00 |
| News grade sulphite | 3.50-3.75 |
| Soda pulp, bleached | 4.50-5.00 |
| Mitscherlich unbleached | 5.00-5.25 |
| Kraft, No. 1 | 4.25-4.50 |
| Screenings, refined | 1.50-1.75 |

## Chemicals

Pulp and paper making chemicals are moving into domestic consuming channels in a consistent manner as well as for export, and prices are generally on the uptrend. Producers are sold well ahead and consumers are placing orders freely as their requirements develop. Prices are:

| | |
|---|---|
| Alum, lump ammonia | 4.25- 4.50 |
| Alum, lump starch | 9.00- 9.50 |
| Alum, powdered | 4.50- 5.00 |
| Blanc fixe | 4.25- 4.50 |
| Bleaching powder (domestic drums) | 2.25- 2.50 |
| Brimstone (ton) | 18.00-20.00 |
| Casein | 14.00-16.00 |
| Caustic soda | 3.00- 3.25 |
| China clay, domestic, washed | 11.00-13.00 |
| China clay, foreign | 15.00-20.00 |
| Rosin, grade E | 18.50- |
| Satin white | 2.25- 2.50 |
| Soda ash, 58 per cent light (bags) | 1.90- 2.00 |
| Sulphate of alumina, commercial grade | 1.80- 2.00 |
| Starch, Globe, in bags | 5.87- |
| Talc (ton) | 12.00-15.00 |

## The Pulp and Paper Trading Co.

21 East 40th Street New York City

**Dealers in Domestic Chemical and Mechanical Pulps and Paper**

AGENTS FOR

J. & J. Rogers Company, Au Sable Forks, N. Y.
Canadian Kraft, Ltd.
Dealers in Wayagamack Kraft
Three Rivers, Canada

EASTERN AGENTS FOR

Port Huron, Michigan, Mitscherlich Sulphite
Made by Port Huron Sulphite & Paper Co., Port Huron, Mich.

## Wisconsin Wire Works

*FOURDRINIER WIRES*

and All Meshes of

*PAPER MILL WIRE CLOTH*

**Appleton Wisconsin**

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*Paper Mill Architect and Engineer*

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## UNION SCREEN PLATE CO.

Fitchburg, Mass., U. S. A. Lennoxville, P. Q., Canada

**UNION BRONZE SCREEN PLATES**

(Best phosphorized Cast Metal)

Old Plates RECLOSED and RECUT to accurate gauge
UNION BRONZE SCREWS for Screen Plates
Immediate Delivery of the Largest Orders. Satisfaction Guaranteed

**The Witham Screen Plate Fastener, Patented**

THE ORIGINAL THE BEST

## ROBERT BLANK

**Paper Manufacturers' Supplies**

*New Cuttings* *Paper Stock* *Rags*

140 Nassau Street NEW YORK

## The Stickle Automatic Steam Control for Paper Machines

WE wish to emphasize the word "automatic." This with us means that the steam follows changes that come to the sheet from free to hard drying stock or any ordinary changes in weights. A control that does not do this in itself is not automatic. This makes a better sheet of paper. We guarantee to hold the moisture at any point you wish with ½ of 1% change. Furnished on 60 days' approval.

**OPEN COIL HEATER & PURIFIER CO.**

INDIANAPOLIS, IND.

BOSTON PHILADELPHIA

## REX Paper Company

*Manufacturers of*

*Coated and OFFSET*

Papers

Kalamazoo, Michigan

At 4:30 p. m. the superintendents were taken on a tour of inspection of the following paper mills at Green Bay: The Northern Paper Mills, the Green Bay Paper & Fibre Co., and the John Hoberg Paper Co., returning at 7:30 p. m. for the farewell dinner at the Beaumont Hotel.

A very brilliant address was given the superintendents at this dinner by Mr. John Welsh, general manager of the Green Bay Paper & Fibre Co.

The cordial welcome that was extended to the Superintendents' Association by the people of Green Bay, and the excellence of the program that was prepared for this occasion by the committee, have left the superintendents present under the firm impression that the success of the association is more than assured.

The Wausau committee is already boasting that they will provide a program for the meeting on October 4 that will not only equal the Green Bay program, but will surpass it by a mile or two. But, as Bill Fogarty says, "They will have to go some and show me." Among those present:

John Hercher, John Strange Paper Co.; George Hesser, Riverside Paper Co.; R. L. Michaels, Wolf River Paper & Fibre Co.; E. W. Sharpless, Menasha Printing & Carton Co.; George Bonner, Falls Paper Mfg. Co.; C. W. Ulrich, Wolverine Paper Co.; R. J. Cunningham, the Northern Paper Mills Co.; Joseph Mulcahey, Flambeau Paper Co.; Paul A. Smith, Combined Lock Paper Co.; Henry Bert, Downing Box Co.; James Clemons, Hummel & Downing Co.; C. E. Raney, Midwest Box Co.; F. E. Pearson, Munising Paper Co.; Wm. A. Kelley, Marathon Paper Co.; Geo. Mericle, Geo. A. Whiting Paper Co.; N. J. Nicks, Kalamazoo Vegetable Parchment Co.; Frank Monaghan, Wausau Sulphate Fiber Co.; D. F. O'Connell, Northern Paper Mills; W. T. Davis, Dells Pulp & Paper Co.; Ed T. A. Coughlin, Monarch Paper Co.; W. T. Fogarty, Northern Paper Mills; J. T. Mader, Menasha Printing & Carton Co.; John Lowe, Appleton Coated Paper Co.; J. M. Shure, Kaukauna Pulp Co.; S. E. Tomczak, Flambeau Paper Co.; Frank Lenz, John Hoberg Paper Co.; Paul Sievert, Marinette & Menominee Paper Co.; F. C. Boyce, Wausau Paper Miils Co.; Ed M. Lenges, Wolf River Paper & Fiber Co.; L. C. Locklin, Manistique Pulp & Paper Co.; A. T. McFarlane, Green Bay Paper & Fibre Co.; Peter J. Massey, Editor of Paper Industry; Edward Shields, Green Bay Paper & Fibre Co.; Chas. E. Garvin, American Writing Paper Co.; W. K. MacNair, the Northwest Paper Co.; C. I. MacNair, Jr., the Northwest Paper Co.; Edward B. Fritz, publisher of The Paper Industry; W. T. Shmitt, American Writing Paper Co.; A. S. Pritchard, Otto Kress, Al Kroes, Stanley W. Widney, H. T. Spaulding, A. L. Kaems, John Hoberg, Frank Hoberg Paper Co.; Perry Wagner, Northern Paper Mills; John Welsh, Green Bay Paper & Fibre Co.; Austin E. Cofrin, Fort Howard Paper Co.

UNLOADING PULPWOOD

**Handle Your Coal and Pulpwood Mechanically with a Byers Auto-Crane**

¶ The rising cost of common labor has caused a large number of paper mills to look for labor-saving devices, and the Auto-Crane has answered the call.

¶ Not confined to tracks, and can go anywhere about your yards. Steam, gasoline or electric power.

*Ask for Bulletin* 1016

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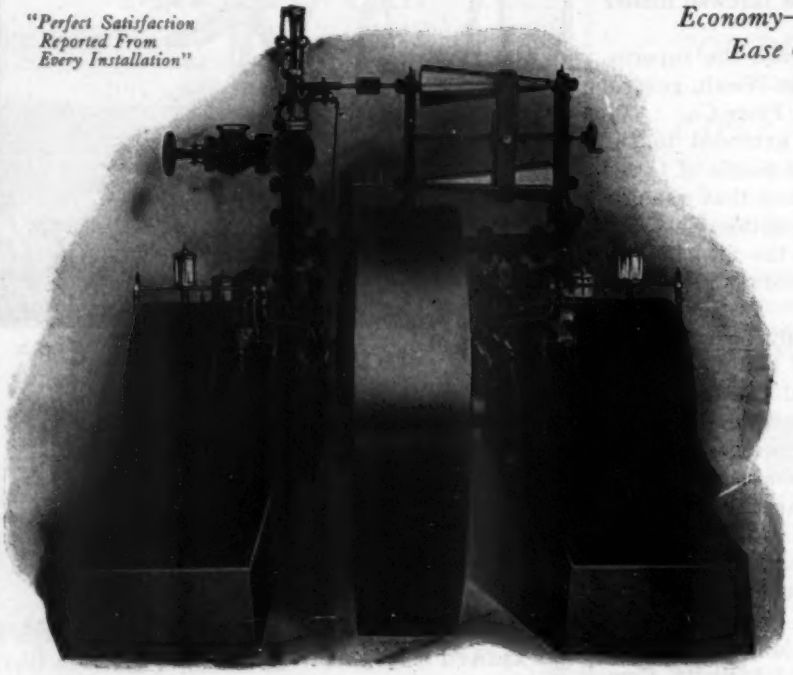
311 Sycamore St., RAVENNA, OHIO

UNLOADING COAL

# *Large, Modern Designed* ENGINES

*"Perfect Satisfaction Reported From Every Installation"*



*Economy—Continuity of Performance—*
*Ease of Care and Adjustment—*
*Infrequency of Repairs—*

These, the important requirements of an engine, are met by "ERIE" double variable speed engines.

*To the Paper Mill Trade*

Repeat orders have without exception been arranged with every user of these engines who has had subsequent requirements, and we will be glad to furnish definite references and full information as to price, delivery and equipment to meet your requirements, and will appreciate an opportunity to furnish these details by mail and the privilege of personal interviews being arranged.

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*ESTABLISHED* **Erie, Pa.** *40 YEARS*

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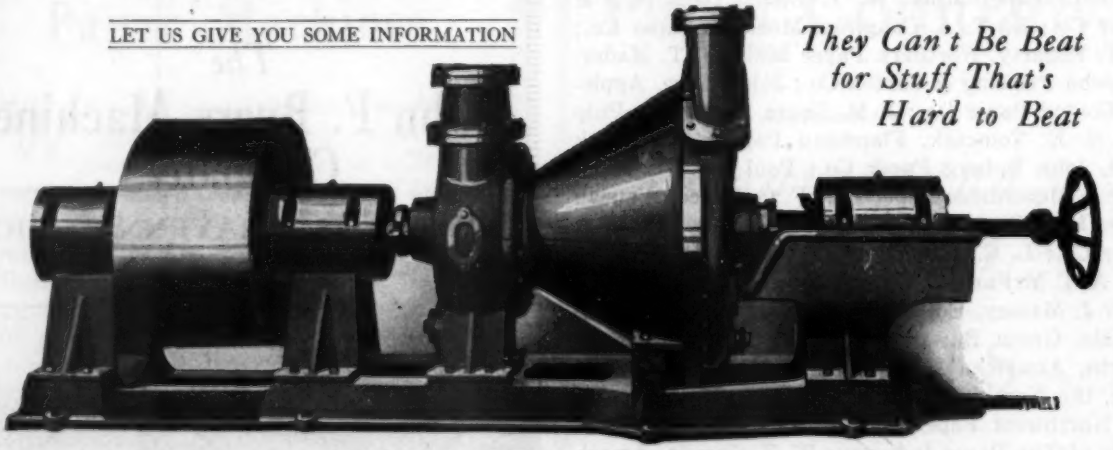
INCREASE YOUR PRODUCTION AND IMPROVE THE QUALITY BY USING

# Claflin Continuous Beaters

LET US GIVE YOU SOME INFORMATION

*They Can't Be Beat for Stuff That's Hard to Beat*



*THEY ARE THE IDEAL EQUIPMENT FOR*

Rope Manilla — Leather Board — Sulphite Screenings
Wall Board — Kraft Paper — Waste from Pulp Stones

**CLAFLIN ENGINEERING CO., Lancaster, Ohio**

THE CANADIAN FAIRBANKS-MORSE CO., Ltd., *Agents for Canada*

Importations of chemical wood pulp from Scandinavia are slowly but steadily increasing, and comparatively large shipments have arrived at New York during the past several weeks. The market tone is strong and importers say they are effecting quite a large volume of purchases on the other side for the account of paper mills in the United States. Thus far very little pulp has been brought in by import firms on their own behalf. Most of the business has been confined to the placing of orders from consumers here with manufacturers in Sweden, Norway and Finland, and buyers have seemingly paid the premium asked on foreign pulp over prices on domestic grades without reluctance, presumably because they need supplies from abroad to augment domestic commitments. Foreign kraft has jumped in price and revised quotations range from $4.25 to $4.75 per pound on the dock. Foreign easy bleaching is being bought freely at $5.25 to $5.50, and unbleached sulphite at $4.75 to $5. Receipts for the past month and current quotations are:

| | |
|---|---|
| Bleached sulphite | $7.50-8.00 |
| Unbleached sulphite, No. 1 | 4.75-5.00 |
| Easy bleaching | 5.25-5.50 |
| Mitscherlich unbleached | 5.50-5.75 |
| Kraft | 4.25-4.75 |

Scandinavian-American Trading Co., 1,680 bls. soda from Gothenburg.

H. J. Andersen && Co., 5,385 bls. bleached sulphite from Christiania.

American Woodpulp Corp., 3,325 bls. sulphite from Gothenburg.

Edwin Butterworth & Co., 200 bls. bleached sulphite from Christiania.

E. M. Sergeant & Co., 1,690 bls. from Christiania.

Tidewater Paper Mills, 32,193 bls. ground wood from Liverpool, N. S.

### Paper Stock

Receipts of foreign rags at New York during recent weeks have increased at a remarkable rate. Enough is it to say that more papermaking rags have come in from abroad during the past month than possibly in any three previous months since prior to the war. Some vessels have brought as many as six or eight thousand bales of rags, and, according to reliable information obtained from members of the import trade, further large quantities are en route to this market or have been bought in Europe for shipment here. Old rope also is arriving in sizeable volume, and fair-sized shipments of bagging and gunny are being frequently received. Arrivals within the past month follow:

#### Rags

R. F. Downing & Co., 60 bls. from Barcelona, 5,761 bls. from Rotterdam.

Brown Bros. & Co., 66 bls. from Antwerp, 211 bls. from Glasgow.

Arrowhead Mills, 324 bls. from London.

Wilkinson Bros. & Co., 57 bls. from Hull, 2,112 bls. from Rotterdam.

Castle, Gottheil & Overton, 47 bls. from Hull, 794 bls. from Rotterdam, 135 bls. from Manchester.

Salomon Bros. & Co., 57 bls. from Hull, 153 bls. from London.

Guaranty Trust Co., 139 bls. from London, 222 bls. from Glasgow.

Certain-Teed Products Corp., 208 bls. from Rotterdam.

George W. Millar & Co., 812 bls. from Rotterdam.

E. J. Keller Co., 695 bls. from Rotterdam, 668 bls. from Ponta del Gada.

Patent Vulcanite Roofing Co., 789 bls. from Rotterdam.

Paul Berlowitz, 217 bls. from Rotterdam.

Equitable Trust Co., 77 bls. from Glasgow, 325 bls. from Rotterdam.

F. W. Bird & Co., 934 bls. from Rotterdam.

#### Old Rope

Bemis Bro. Bag Co., 20 coils from Bristol.

International Purchasing Co., 137 coils from Bristol, 739 coils from Hull.

Brown Bros. & Co., 129 coils from Bristol.

Old Colony Trust Co., 125 coils from Bristol.

Castle, Gottheil & Overton, 141 coils from Bristol.

#### Old Bagging

Edwin Butterworth & Co., 529 bls. from Manchester.

A. Salomon, Inc., 217 bls. from Manchester.

R. F. Downing & Co., 390 bls. from Rotterdam.

Paul Berlowitz, 204 bls. from Rotterdam.

#### Miscellaneous Paper Stock

Daniel M. Hicks, 102 bls. from Rotterdam.

Maurice O'Meara Co., 55 bls. from Manchester.

Castle, Gottheil & Overton, 1,255 bls. from Rotterdam, 135 bls. from Manchester.

E. J. Keller Co., 348 bls. from Rotterdam.

Irving National Bank, 1,238 bls. from Rotterdam.

Salomon Bros. & Co., 323 bls. from Rotterdam.

Edwin Butterworth & Co., 131 bls. from Barcelona.

Guaranty Trust Co., 154 bls. from Glasgow.

Brown Bros. & Co., 38 bls. from Glasgow.

In pointed contrast to the sharp increase in importations of paper-making materials, arrivals of paper at New York from foreign countries have been of considerably smaller volume during the past month.

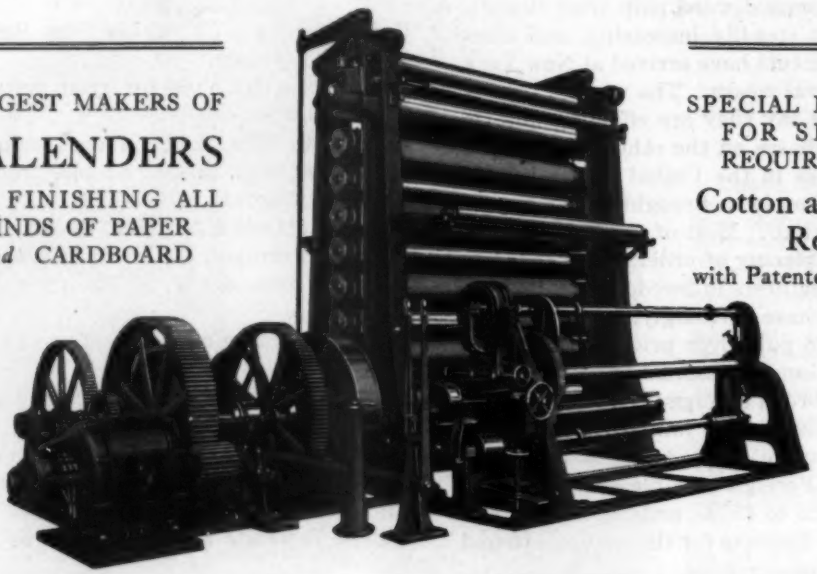
# Holyoke Machine Co. HOLYOKE MASS.

*Makers of Improved Machinery for Wood Pulp & Paper Mills*

LARGEST MAKERS OF

CALENDERS

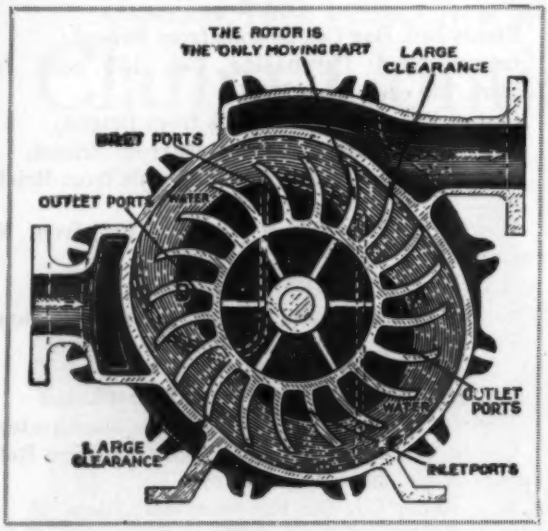
FOR FINISHING ALL KINDS OF PAPER *and* CARDBOARD



SPECIAL MACHINES FOR SPECIAL REQUIREMENTS

Cotton and Paper Rolls

with Patented Fastenings




*The WORD and the MARK*

# HYTOR

This stands for the great superiority, high efficiency, durability and reliability of the

**NASH HYTOR VACUUM PUMPS**

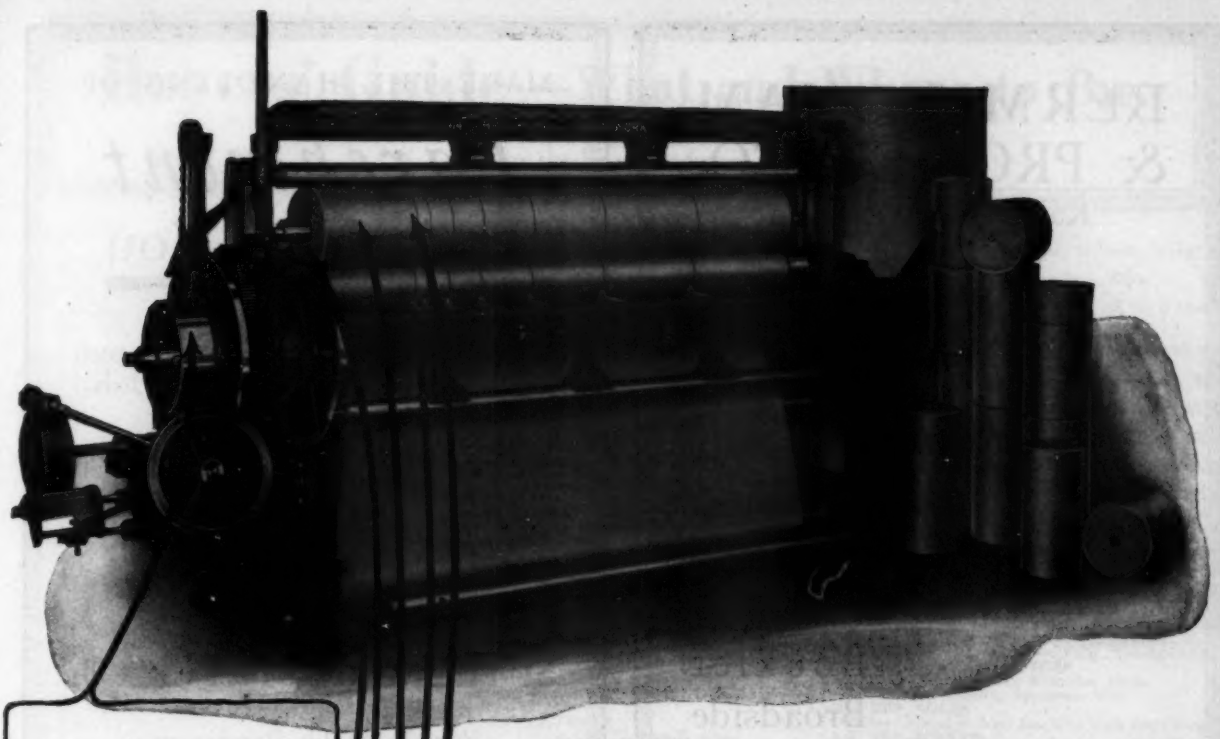
**NASH HYTOR AIR COMPRESSORS**

**and JENNINGS HYTOR DRYER EXHAUST UNITS**

*For Full Information and Particulars, Address*

## THOMAS H. SAVERY, Jr.

**1718 Republic Building** **CHICAGO, ILLINOIS**



High Speed Drive

Treadle Control Variable Speed

Even Edges

Firm Even Tensioned Rolls

Quick Change of Cutters

Clean Cut

# A FEW Important Features of the Cameron Principle Slitting and Rewinding Machine

The advantage of the Cameron "Score Cutter" method, considered apart from the fact that it is the ideal method to combine with the Surface Rewind, may be summed up as follows:

1. The "Score Cutter" does perfect work on any kind of paper made, as well as fabrics and other materials.

2. The "Score Cutter" gives a clean, smooth slit and does not stretch the edge of the paper.

3. The "Score Cutter" will operate perfectly at unlimited speed as there is practically no friction or wear on the cutting edge.

4. The "Score Cutter" need not be kept to any special diameter, as the pressure spring will take up any variation.

5. The "Score Cutter" does not have a keen cutting edge, but an edge slightly blunt like a cold chisel, and it is easily kept in prime condition by the operator.

6. The same features which make the "Score Cutter" efficient for light duty, make it equally serviceable for heavy duty, as it will handle work from the sheerest tissue paper up to box board.

7. Re-spacing of "Score Cutter" is quickly done by simply releasing the spring pressure on all the cutters at once, and sliding the cutter holders to the new positions.

8. Re-spacing of "Score Cutters" requires only five to ten minutes for any new arrangement of widths. When Gang Spacers are used for narrow strip, even less time is required.

9. Removing or replacing a cutter requires only to lift it on or off its support—holder and all—without disturbing any other cutter or any part of machine.

10. Any width or assortment of widths can be spaced from one-quarter inch up.

11. Strip as narrow as one-quarter inch can be produced by special "Score Cutters."

12. The waste or trim at the edges may be extremely narrow.

13. The rolls produced do not interweave or stick together.

14. Injury to the operator by this method of slitting is impossible.

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— Kalamazoo, Michigan —

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¶If you have not received a set we will gladly send one.

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*Special Price Lists*
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KALAMAZOO MICHIGAN

**SIMONDS**
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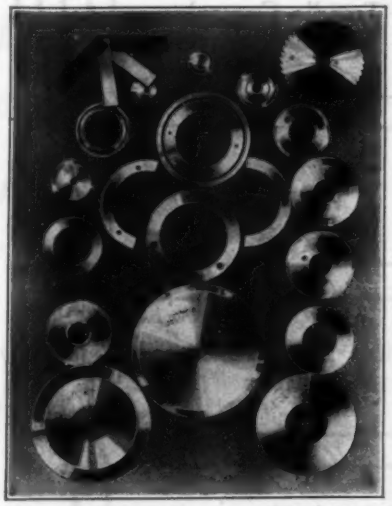
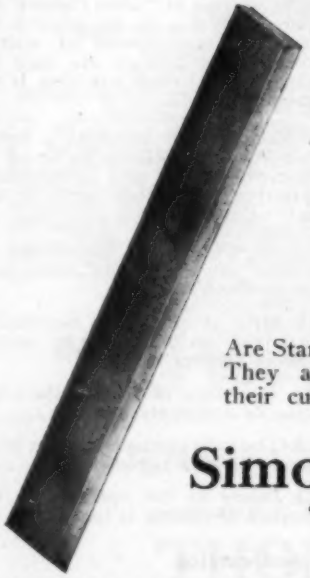
*and Circular*
*Cutters*





Are Standard in Quality and Workmanship. They are uniform in temper and hold their cutting edge. In extensive demand.

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*"The Saw Makers"* *Established 1832*
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PORTLAND, ORE.
LOCKPORT, N. Y.
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LONDON, ENGLAND
MONTREAL, QUE.
MEMPHIS, TENN.
SEATTLE, WASH.
ST. JOHN, N. B.

# Buyers' Guide—What and Where to Buy

**Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry**

**ADHESIVES**
The A .P. R. Mfg. Co., 316 West Grand Ave., Chicago.
**AGITATOR EQUIPMENT**
The Hill Clutch Co., Cleveland, Ohio.
**AIR CONDITIONING AND CONTROL APPARATUS**
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
**ANGLE VALES**
The Crane Company, Chicago, Ill.
**ARCHITECTS**
James L. Carey, 208 N. Laramie St., Chicago.
**ASSORTING TABLES**
Moore and White Co., Philadelphia, Pa.
**ASH CONVEYOR SYSTEMS**
American Steam Conveyor Corp., Chicago, Ill.
**BARKERS**
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works Co., Appleton, Wis.
**BARKING DRUMS**
H. O. Numan, Green Bay, Wis.
**BEATER BARS**
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
**BEATER BED PLATES**
John W. Bolton & Sons, Inc., Lawrence, Mass.
**BEATER ROLL FILLING**
R. J. Dowd Knife Works, Beloit, Wis.
**BEATING, WASHING AND BLEACHING ENGINES**
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works Co., Appleton, Wis.
**BEATERS (Continuous)**
Claflin Engineering Co., Lancaster, Ohio.
**BELTING (Rubber)**
United States Rubber Co., New York and Chicago
**BELT DRIVES**
The Hill Clutch Co., Cleveland, Ohio.
**BLEACHING (Propellers)**
Moore and White Co., Philadelphia, Pa.
**BLOWERS**
Buffalo Steam Pump Co., Buffalo, N. Y.
**BOARDS (Straw)**
The C. L. La Boiteaux Co., Cincinnati, O.
**BOILER COMPOUND**
The Boiler-Kote Co., 343 S. Dearborn St., Chicago, Ill.
**BRASS WIRE CLOTH**
Appleton Wire Works, Appleton, Wis.
Lindsay Wire Weaving Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.
**BRONZE JACKETS**
Sandusky Foundry & Machine Co., Sandusky, Ohio.
**BUNDLING SYSTEMS**
Signode System, Lake St., Chicago
**CALENDERS**
Holyoke Machine Co., Holyoke, Mass.
**CALENDER DOCTORS**
Ticonderoga Machine Works, Ticonderoga, N.Y.
**CALENDER ROLLS**
Holyoke Machine Co., Holyoke, Mass.
B. F. Perkins and Son, Inc., Holyoke, Mass.
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American Steam Pump Co., Battle Creek, Mich.
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# Alphabetical Index to Our Advertisers

When writing them, please mention The Paper Industry


A

PAGE

American Printers' Roller Mfg. Co., 316 W. Grand Ave., Chicago ..... 378
American Steam Conveyor Corp., Chicago, Ill. ..... 390
American Steam Pump Co., Battle Creek, Mich. ..... 383
Andersen & Co., J., 21 E. 40th St., N. Y. C. ..... 390
Appleton Wire Works, Appleton, Wis. ..... 330

B

Bardeen Paper Co., Otsego, Mich. ..... 386
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
Bermingham & Prosser, Kalamazoo, Mich. ..... 398
Binney & Smith Co., 81-83 Fulton St., New York City.. 379
Blank, Robert, 140 Nassau St., N. Y. C. ..... 392
Brown Hoisting Machinery Co., Cleveland, Ohio ..... 387
Bryant Paper Co., Kalamazoo, Mich. ..... 332
The Boiler Kote Co., 343 S. Dearborn St., Chicago..... ..... Front Cover
Bolton, John W. & Son, Lawrence, Mass. ..... 375
Buffalo Steam Pump Co., Buffalo, N. Y. ..... 325
Byers Machine Co., John F., Ravenna, O. ..... 393

C

Cameron Machine Co., Brooklyn, N. Y..... 397
Carey, James L., 208 N. Laramie St., Chicago, Ill. ..... 392
Central Manufacturing Co., Kalamazoo, Mich. ..... 379
Chandler & Taylor, Indianapolis, Ind. ..... 381
Claflin Enginering Co., Lancaster, Ohio ..... 394
Crane Company, The, Chicago, Ill. ..... 400

D

Dowd Knife Works, R. J., The, Beloit, Wis. ..... 400
Du Pont de Nemours & Co., Wilmington, Del. ..... 329

E

Eastern Manufacturing Co., 501 Fifth Ave., N. Y. C. .... 382
Economy Engineering Co., The, Chicago, Ill..... ..... Inside Back Cover
Erie Engine Works, Erie, Pa. ..... 394

G

Gatti-McQuade Co., 200 Fifth Ave., New York City.... 384
Graver Tank Works, East Chicago, Ind. ..... 327
Green Bay Foundry & Machine Works, The, Green Bay, Wisconsin .....Inside Front Cover

H

Hall, Ward &Walker, Sherman Bldg., Watertown, N. Y... 385
Hicks, Daniel M., 140 Nassau St., N. Y. C. ..... 379
Hill Clutch Co., Cleveland, Ohio ..... 386
Higman, The John W. Co., Inc., 29 Broadway, N. Y. C. 375
Holyoke Machine Co., Holyoke, Mass. ..... 396
Hooven, Owens, Rentschler Co., Hamilton, Ohio..... 337
Husband & Nash, Menasha, Wis. ..... 336
Hughes Co., Francis, 21st and Loomis St., Chicago ..... 388
Hudson & Sharp Machine Co., Green Bay, Wis..... 386

K

Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich. 379

L

PAGE

La Boiteaux, The C. L. Co., Cincinnati, Ohio ..... 381
Lakeside Paper Co., Neenah, Wis. ..... 377
Leffel and Company, James, Springfield, Ohio ..... 382
Lindsay Wire Weaving Co., The, Cleveland, Ohio..... 376

M

Main Paper Stock Co., 25-31 Peck Slip, N. Y. C. ..... 388
Mendelson Bros. Paper Stock Co., 910 Michigan Blvd., Chicago ..... 388
Miner-Edgar Co., 30 Church St., N. Y. C. ..... 388
Monarch Paper Co., Kalamazoo, Mich. ..... 385
Moore & White Co., Philadelphia, Pa. ..... 323
Munsing Paper Co., Munsing, Mich. ..... 334

N

New York Overseas Co., 17 Battery Place, N. Y. C. ..... 390
Northern Engineering Works, Detroit, Mich. ..... 375
Northern Paper Mills, Green Bay, Wis. ..... 377
Numan, H. O., Green Bay, Wis. ..... 385

O

Open Coil Heater and Purifier Co., Indianapolis, Ind. .. 392

P

Perkins & Son, Inc., B. F., Holyoke, Mass. ..... 381
Pulp & Paper Trading Co., 21 E. 40th St., N. Y. C. 334 & 392
Price & Pierce, 30 E. 42nd St., N. Y. C. ..... 390

R

Rex Paper Co., Kalamazoo, Mich. ..... 392

S

Sandusky Foundry & Machine Co., Sandusky, Ohio .... 402
Savery, Thos. H., Republic Bldg., Chicago, Ill. ..... 396
Scaife and Sons Co., Wm. B., Oakmont Pa. ..... 379
Scandinavian American Trading Co., 50 E. 42nd St., N. Y. C. ..... 390
Seaman Paper Co., Chicago, Ill. ..... 328
Shuler & Benninghofen, Hamilton, Ohio ..... 383
Signode System, Chicago, Ill. ..... 383
Simonds Manufacturing Company, Fitchburg, Mass. .... 398
Sutherland Paper Co., Kalamaoo, Mich. ..... 398

T

Ticonderoga Machine Works, Ticonderoga, N. Y. ..... 385
Thomas, E. B. Co., New York City ..... 388

U

Union Screen Plate Co., Fitchburg, Mass. ..... 392
United States Rubber Co., New York ..... 336

V

Valley Iron Works Co., Appleton, Wis. ..... Back Cover

W

Watervliet Paper Co., Watervliet, Mich. ..... 326
Wausau Sulphate Fibre Co., Mosinee, Wis ..... 380
White Co., L. & I. J., 85 Columbia St., Buffalo, N. Y..... 381
Wilson, F. D., 1520 Lumber Exchange Bldg., Chicago, Ill. 402
Wisconsin Wire Works, Appleton, Wis. ..... 392
Wolverine Paper Co., Otsego, Mich. ..... 383

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